UNIVERSITY OF LONDON
FRANCIS GALTON LABORATORY FOR NATIONAL EUGENICS

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A FIRST STUDY OF THE INFLUENCE OF PARENTAL ALCOHOLISM ON THE PHYSIQUE AND ABILITY OF THE OFFSPRING

BY

ETHEL M. ELDERTON,
GALTON RESEARCH SCHOLAR IN NATIONAL EUGENICS
IN THE UNIVERSITY OF LONDON

WITH THE ASSISTANCE OF
KARL PEARSON, F.R.S.

WITH 8 DIAGRAMS IN TEXT.

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CONTENTS

PREFATORY NOTE

In issuing this second edition of our First Study to meet the very great demand there has been for it, we had the alternative of recasting the whole paper in order to meet the objections of critics, or of leaving it in its original form. We have preferred the latter course, partly because on re-reading our own paper it appeared to us that a careful study of our text and tables really supplied the answers to most of the criticisms which, not being of a rhetorical and unscientific character, deserve to be considered, and partly because the only rebutting evidence cited by critics is not closely allied to our present form of investigation and therefore has been dealt with at length in a separate study.

E. M. E.
K. P.

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A First Study of the Influence of Parental Alcoholism on the Physique and Ability of the Offspring.

(1) *Introduction.* An attempt is made in this paper to measure the effect of alcoholism in the parents on the health, physique and intelligence of their offspring. The question of intemperance is one of the chief problems of our national life, and as such it is beset with difficulties. It is surrounded with prejudices and has been too often treated with rhetoric, so that it is extremely difficult to free the mind from preconceived opinions and approach the subject with a purely judicial and calm statistical spirit. Yet if we are to deal with the drink question in a satisfactory and permanent fashion, reform must be guided by an instructed public opinion. No greater evil is done to a good cause, than when statistically undemonstrable statements receive, owing to emotional appeals, general credence, and then wider experience shows them later to be inexact. Nor again when we demonstrate that certain social results do not flow from alcohol, ought we to be charged with asserting that other results which we have not considered may not be directly due to it. The desire to know before acting, and the mind which refuses to express an opinion before knowledge, are so unfamiliar to many workers in the field of social reform, that the possibility of starting an inquiry without any bias as to its result seems to them almost an iniquity, the mark of an abnormal temperament.

Students of eugenics are not measuring the effect of any occupation or habit on the individual, but the effect that such occupation or habit may have on the racial qualities of future generations. They are not concerned with the effect of drink on the person who drinks, but they are concerned with the results that drinking produces in the offspring. These results may be due to three different sources:

(i) Alcoholism in the parent may, like insanity, be the somatic mark of a defective germ plasm in the stock. The child is defective not because the parent is alcoholic, but because it is the product like the parent of a defective germ plasm. The child may be physically and mentally fit, and yet when adult may exhibit alcoholic tendencies. This is the direct heredity of alcoholism. It is a subject not touched on in this paper, although material for its discussion is accumulating in the Galton Laboratory. It may be demonstrable to the hilt, and possibly justify the seclusion of the alcoholic; it does not occupy us, however, in this present study; we are concerned only with the offspring of the alcoholic as *children*. An equally important point is the cross-heredity of alcoholism. If alcoholism is a mark of a defective germ plasm, that defect may take one form in one individual of the stock and another form in a second; such associated heredities are well known to the student of insanity and of human deformities. The fact that the parent is alcoholic may lead us to expect an

increase of imbecility, epilepsy or tuberculosis in the offspring. This matter is only indirectly touched on in the present paper. It is not easy to distinguish such cross-heredity from our second source of alcoholic influence.

(ii) Alcoholism in the parent may have no hereditary origin; it may be considered as a habit due to environment and not to constitution, the effect on the child may be due to an environmental influence and not to any cross-heredity. The former cross-heredity would have come into play, if the parent had been forcibly deprived during life of alcohol; the child would still have been defective. This second source of harm to the children would arise even in the case of a parent, who was non-alcoholic by heredity, but who became alcoholic by habit or environment. The source of harm to the offspring lies in an enfeeblement of the physique, or possibly of the germ plasm of the parents, owing to a toxic property of alcohol.

(iii) Alcohol may thirdly be the source of evil to the children, not because of physical changes wrought in the parents, but because of economic and moral changes produced in the home environment. Mental and moral degradation of the parents, distress and poverty in the home may and probably do follow in the train of intemperance. Money spent excessively on drink means less money spent on the necessities of life; it leads to neglect of the children, to unhappy homes, and to undesirable environment. In any consideration of the results of alcoholism these very obvious facts arrest our attention, and we are inclined to lose sight of the really fundamental question: What is the quantitative measure of these environmental influences on the physical and mental characters of the offspring? It seems useful to class the three sources of alcoholic influence of the parent under the categories: (i) Hereditary Influence (a) Direct, (b) Cross; (ii) Toxic Influence, and (iii) Environmental Influence.

With (i) (a) we are not at present concerned, but hope that it will be dealt with later. We are dealing only with children, not yet of an age to exhibit definite alcoholic tendencies. Between (i) (b), (ii) and (iii), it will be difficult to differentiate on the basis of the present material. But the necessity for differentiation will only arise, if we demonstrate a substantial correlation between alcoholism in the parent and defectiveness in the child. Should such a correlation exist, then for a permanent and valuable scheme of social reform it is needful above all things to ascertain whether it is the cross-heredity, the toxic influence or the environmental influence which is the source or chief source of the resulting harm to the child. Complete prohibition would not remedy the cross-hereditary influence, it could only be met by the prohibition of parentage for members of affected stocks. Complete prohibition would put a stop at once to the toxic influence; either complete prohibition, or the removal of offspring would meet the environmental influence. Surely it is worth while to get some light on these points, before we tackle this great problem of alcoholism. And if it should be that more extensive data confirm the results of this preliminary study would it not be of considerable importance to realise that we must look to other factors besides drink as potent sources of our social difficulties?

Some hesitation will no doubt be felt by some of our readers at the lay treatment of a problem of this kind. But the reply to this is two-fold. The medical man as

a rule has no opportunity of dealing with a random sample of the general population; it is the social worker who goes into the homes who alone can appreciate the extent of the drinking habit, and record the economic conditions of the working population. Individual medical men see, of course, much more of special and extreme cases, but it is not part of their duty to appreciate and report on random samples of the general population. In the next place but few medical men at present have either the statistical training or the statistical tastes needful for an inquiry of this kind. It must fall to those whose duty it is at present to inquire into the social condition of the people—i.e. the social worker—and to those whose occupation is the treatment of statistics. We believe firmly that the day must come when for the treatment of these great social problems a laboratory shall be adequately endowed in which it shall be possible for sociologically trained, medically trained and statistically trained minds to work side by side for their solution. But until that day dawns, it is not reasonable to postpone sociological inquiry until a medical diagnosis can be taken of each individual. Such a diagnosis would be of immense value as making our classification precise. But failing it we must content ourselves with such categories as are provided by a single worker, or by a system of workers trained on a common plan. Such categories as *sober, drinks, has drinking bouts,* are not final, but they at least enable us to see further than we can without the knowledge they convey. Accordingly by the term alcoholism in this paper is not necessarily meant the "chronic alcoholism" of medical literature. We believe that many, possibly the majority, of our drinking class would be found to suffer more or less from chronic alcoholism; they at any rate in the opinion of trained social workers—assisted by the judgment of police and employers—are drinking more than is good for them or their homes. On the other hand by "sober" is not meant total abstinence, but cases in which the use of alcohol is so moderate, if it exists, that it does not appear to interfere with the health of the individual or the welfare of the home. Such then is the distinction between "parent drinks" and "parent is sober" of the following investigation. "Parent has drinking bouts" denotes a third well-marked class from the standpoint of the social observer; namely periodic outbreaks of alcoholism usually marked when they occur by more obvious immediate detriment to health, and more intense destruction of home welfare, e.g. discharge from employment, or visits to the police court.

(2) *Characteristics of Alcoholic Parents.* In any attempt to study the results of environment we are at once met by many difficulties, which in some cases are insoluble owing to our lack of adequate data. We may measure the effect of some environmental condition and find it correlated with definite characteristics in the children. We may then assume the latter to flow from the former, whereas the environmental condition may be a result of a physical or mental condition in the parents, which in itself is hereditary. Thus the correlation may be solely a secondary hereditary effect. It is possible that the more virile members of the community habitually take more alcohol than the feebler members and we might thus be led to a spurious correlation between alcoholism and good physique in the offspring. Or, the more stupid members of the community may be those who take more alcohol, and we might thus be led to the result that parental drinking destroys the intelligence of the

offspring. One of the greatest needs of the time, as the school surveys will show, is to associate the survey of the physique and mentality of the children, not only with a survey of the homes, but with a survey of the health of the parents, and if possible with some anthropometric examination of the parents. This at present is not feasible. But how, failing it, are we to be certain that drinking parents may not be physically or mentally differentiated from sober parents, and therefore differentiation of the offspring a secondary hereditary result? Nay, it might even be argued that if drinking parents were physically and mentally fitter than sober parents, the equality in the physique and mentality of children of both types of parents was due to alcohol pulling down to the average a child who should have been above the average. The point may seem at first sight an unnecessary one to raise; but therein lies really a vital question to the student of modern statistical methods: What are the correlations of physique and intelligence with the drinking habit? The answer cannot be given on the data used in this paper, but there is other material in the Laboratory upon which an answer to this question can ultimately be based. The only light that can be thrown on this matter from our present data is an indirect one. The wages of the father are to some extent a measure of the general status as to physique and intelligence of the parent. A man who is physically and mentally unfit will hardly receive high wages, whether he be drunk or sober. Clearly the general tendency of drink must when it reaches a certain intensity tend to lower a man's wages. We should therefore expect to find the wages of the drinking man somewhat less than those of the sober man; if in addition he has defective physique and intelligence, we should expect to find them markedly less than those of the sober man. In certain special cases no doubt peculiar skill in craftsmanship may lead to high wages and high wages to alcoholism; but the maintenance of high wages under such conditions can only be very exceptional and can only affect individual cases and the average but little. We think it may be safely affirmed that if the alcoholic parent were markedly inferior in physique or intelligence his average wages would be markedly less than those of the sober parent. Now in part of the material dealt with in this paper, the Edinburgh data, the wages are given in nearly every case. Parents were divided into three classes: (1) both parents drink, (2) one parent drinks and (3) neither parent drinks. The mean wage of the father when both parents drink was 24*s.* 8*d.*; when one parent drinks 25*s.* 6*d.* and when neither parent drinks 25*s.* 5*d.* Or, grouping in another way, when either or both drink 25*s.* and when neither drink 25*s.* 5*d.* If we consider the father alone, for it is not possible to apply the wages test to determine the drinking mother's status in comparison with other mothers, we find that the wages of a drinking man are on the average 25*s.* and a non-drinking man 26*s.* It would be reasonable to suppose that the 6*d.* or 1*s.* difference shown in the above results is what the employer is willing to pay for the convenience of sobriety. It can hardly mean that there is a great differentiation in physique and intelligence between the alcoholic and the non-alcoholic*. At any rate if the alcoholic are physically and mentally inferior, one might expect this fact together with the inconvenience of insobriety would be indicated by a higher wage difference. Of course

* A reply to Professor Marshall's criticism of these wage-results will be found in *Questions of the Day and the Fray*, No. I, Dulau & Co.

a somewhat higher physique or intelligence in the alcoholic might be screened by their habits giving them a lower market value. On the whole it seems reasonable to assume that the drinking parents are in physique and mentality the equal on an average of the sober, or possibly a little above their standard. This possible slight difference will hardly sensibly affect the correlations between parental alcoholism and the health and intelligence of the children.

(3) *Material.* We have used for the purposes of this paper two series of statistics bearing on the question of drink and its effect on the children; the Edinburgh Charity Organization Society Report and a manuscript account of the children in the special schools of Manchester provided for us by Miss Mary Dendy*. In dealing with the children in these special schools it must be remembered that we are considering a selected class of homes; of the children in these homes one at least is mentally defective. In the families chosen for investigation by the C.O.S. in Edinburgh the selection is much less stringent; the homes of all the children attending a certain school in Edinburgh were examined and the school was chosen because "It has upon its rolls children from the poorest parts of the city, and yet it has also an admixture of the substantially comfortable and thoroughly respectable working class," and the report goes on to say, "In the poorest part of a city of many centuries' growth there are also many 'old families' who continue to reside in the houses their fathers and grandfathers lived in, for old times' sake, despite of the degeneration of the immediate neighbourhood. This gives the school a widely representative character, which especially commended itself to the Committee in making its selection."

In the Manchester data the parents were divided into "temperate" and "intemperate" and information was given about the health and in most cases about the intelligence of the brothers and sisters of the mentally defective child.

In the Edinburgh report more details were given as to the degree and kind of drinking of the parents but the numbers are too few to enable us to use these divisions in detail, the tables in the Appendix give the numbers in each class. We were able to divide the parents into the following classes. Parent: (1) Teetotaller, (2) Sober, (3) Suspected to drink, (4) Drinks, (5) Has bouts of drinking. As will be seen from the tables, classes (1) and (3) were too small to be kept separate and teetotallers had to be included with sober people and suspected drinkers with drinkers.

We have worked out the correlation coefficients between the drinking of the parents and the actual height and weight of the children, their health, intelligence, diseases and eyesight and the effect on the infant death rate. In determining the drinking capacities of the parents we have used the account of each home given in the Report, in the same manner as we have done in other memoirs. It is a personal judgment, but one substantially repeated on going through the data a second time.

(4) *Drink of Parents and Height and Weight of Children.* We will first consider the effect of the drinking of the parents on the actual height and weight of their children. The tables are Numbers I to XVI inclusive in the Appendix. In this

* The material was collected by the late Dr Ashby, who personally saw one or both parents. The houses were visited by trained visitors.

case we first divided our statistics into two groups only, one or both parents drink and neither parent drinks and worked the correlations out by the new method discussed by Professor Pearson in *Biometrika*, Vol. VII. p. 96*. The first step in this method of finding a correlation coefficient is to find the means of the classes. We found that the mean height of the sons of non-drinking parents was 47·5 inches and of the sons of drinking parents was 47·9 inches and the correlation was ·07, that is to say a very slight connection between drinking parents and taller sons and we found much the same for weight; the mean weight of the sons of non-drinking parents was 53·8 lbs. and of the sons of drinking parents was 55·0 lbs. and the correlation between drinking parents and heavier sons was found to be ·06. We had to put all ages together so we had next to correct for the correlation between the drinking of the parents and age of the children†.

We found that the mean age of the sons of non-drinking parents was 9·4 and of drinking parents was 9·8 and the correlation between drinking parents and older sons was ·11. Using the formula for partial correlation we found that the coefficient between drinking parents and poorer physique in their sons for a constant age was ·04 for height and ·05 for weight. The results are given in Table I for girls and boys.

TABLE I.

		Mean height	Mean weight	Mean age	Correlation coefficients: Drink and height	Correlation coefficients: Drink and weight	Correlation coefficients: Drink and greater age	Partial correlation coefficients: Drink and height for constant age	Partial correlation coefficients: Drink and weight for constant age
Boys	Parents sober	47·5	53·8	9·4	−·07	−·06	·11	·04 ± ·03	·05 ± ·03
	Parents drink	47·9	55·0	9·8					
Girls	Parents sober	46·8	52·7	9·3	·03	·02	·03	·09 ± ·03	·08 ± ·03
	Parents drink	46·6	52·3	9·4					

The minus sign when it occurs means that a better condition in the child is correlated with drink in the parent.

The results differ slightly for girls and boys as the table shows, and in the final results given in the last two columns we see that the correlation coefficient between drinking and less height is ·04 for boys and ·09 for girls and between drinking and less weight is ·05 for boys and ·08 for girls.

This is a case where a probable error is a necessity in order to enable us to judge whether these results are significant. The probable error for the partial correlation coefficient has been shown‡ by Mr Heron to be the same in form as for the absolute

* "On a new method of determining correlation between a measured character *A*, and a character *B*, of which only the percentage of cases wherein *B* exceeds (or falls short of) a given intensity is recorded for each grade of *A*."

† i.e. as the parents grow older, the children grow older, and some alcoholism develops with the parents' age.

‡ *Biometrika*, Vol. VII. Part III.

coefficient and it is equal to ·03 in each of the above cases. With a probable error of ·03 one can only say that values of ·04 and ·05 are insignificant and only slight significance attaches to values of ·08 and ·09.

We next separated the father and mother and worked out the correlations between the father's drink and his child's height and weight and between the mother's drink and her child's height and weight; the results are given in Table II.

TABLE II.

		Correlation coefficients					Partial correlation coefficients	
		Drink and height	Drink and weight	Drink and greater age	Age and height	Age and weight	Drink and height for constant age	Drink and weight for constant age
Sons	Father	−·04	−·05	·08	·81	·81	·04 ± ·03	·04 ± ·03
	Mother	−·01	−·01	·07	·81	·81	·08 ± ·03	·08 ± ·03
Daughters	Father	·03	·04	·00	·81	·82	·03 ± ·03	·04 ± ·03
	Mother	·02	·03	·07	·81	·82	·13 ± ·03	·14 ± ·03

The last two columns give the final results, i.e. the correlation between the drink of the father and mother and the height and weight of their children. The drinking of the mother is seen to have more effect on her child's physique than the drinking of the father. There is practically no correlation between the father's alcoholism and his child's physique for either boys or girls, but there is a connection between the mother's alcoholism and her child's physique, and this connection appears to be greater for girls than boys. The last fact makes it very difficult for us to assert that the slightly poorer physique is a result of a toxic influence. There is no reason to suppose that such would affect the male less than the female; it is far more probably due to the factor of undesirable home environment; the alcoholism of the mother throws more home duties on the girl-child; lessened care would affect boy and girl alike and probably does so. Some of the greater influence of the alcoholic mother as compared with the alcoholic father may be due to the fact that alcoholism in the mother is correlated with another environmental factor, which we have found associated with slightly lessened physique in the offspring, I refer to the employment of the mother. From the Edinburgh Report we find that 43·6% of drinking mothers are employed and only 26·4% of sober mothers; the correlation between employment and drink is ·28. We have thus distinct evidence that alcohol quite apart from any toxic effect is associated with a modified home environment*. If we allowed for this fact of greater employment of alcoholic mothers we should find some reduction in the intensity of the correlation of maternal alcoholism and physique of offspring, but it would not account for the whole value. It is chiefly of interest as showing that we cannot conclude from a correlation of the child's physique and parental alcoholism the

* It is also conceivable that the alcoholic mothers are racially differentiated, and this would produce a physical differentiation in the offspring of alcoholic mothers.

existence of a toxic effect until we have considered how far the parental alcoholism is associated with differentiation in the occupations or habits of the parents—shortly with environmental differences, which do not necessarily flow even from the alcoholism, but may like the mother's employment be possibly the source of the alcoholism itself.

We may we think infer from the above results that the father's alcoholism has no sensible influence on the physique of the child. The mother's alcoholism has a small but quite sensible influence on the height and weight of the child, more sensible in the case of the girl than the boy. It is probably due, not to any toxic effect of the alcoholism, but to increased unfavourable home environment. Even where the relation is the highest, i.e. ·14, it has only about $\frac{2}{7}$ the intensity of parental heredity.

(5) *Parental Alcoholism and General Health of Offspring.* We will next consider the general health of the children of alcoholic parents. The tables are numbers XVII to XXIV inclusive in the Appendix.

(i) *Manchester.* From Miss Dendy's manuscript account of the children in the special schools of Manchester* we have been able to divide the health of the brothers and sisters of the defective child into the following classes: (*a*) Normal, (*b*) Delicate, (*c*) Phthisical and Epileptic, (*d*) Died young of "fits," "wasting" etc. The parents in this case could be divided into two classes only, those who are temperate and those who are intemperate. The percentages of children of temperate and intemperate parents having the different grades of health are given below.

		Father temperate	Father intemperate
Son	Healthy	57·8	59·2
	Delicate	14·8	15·8
	Epil. & Phth.	9·1	4·3
	Died young...	18·3	20·7

		Father temperate	Father intemperate
Daughter	Healthy	57·2	61·7
	Delicate	14·8	13·9
	Epil. & Phth.	6·1	3·9
	Died young...	22·0	20·5

		Mother temperate	Mother intemperate
Son	Healthy	57·5	61·7
	Delicate	15·0	19·4
	Epil. & Phth.	5·3	2·2
	Died young...	22·2	16·7

		Mother temperate	Mother intemperate
Daughter	Healthy	59·0	57·6
	Delicate	14·7	18·2
	Epil. & Phth.	8·4	3·0
	Died young...	18·0	21·2

It will be seen from these percentages that the differences between the health of the children of temperate and intemperate parents are very slight having regard to the numbers available and there is a certain amount of irregularity. The only fact that is constant throughout the four tables is the larger percentage of children suffering from epilepsy and phthisis among the children of temperate parents and an examina-

* The medical details of this account were prepared under the control of the late Dr Ashby.

tion of the curves (p. 10) shows this very clearly. In three out of four cases we find a slightly larger number of healthy children among the children of intemperate parents and a slightly larger number of delicate; in the "died young" class we find in two cases the larger number among the children of intemperate and in two cases among the children of temperate parents. It is obvious from these tables that the correlations will be very small and that it will be difficult to decide whether, taken as a whole, they are to be considered positive or negative, i.e. whether the connection is between intemperance and bad health or between intemperance and good health.

These correlations have been worked out in two ways: (i) by a method giving η which will be discussed by Professor Pearson in the next number of *Biometrika* * and (ii) by the fourfold method giving r. In using the fourfold method we grouped "delicate," phthisical, epileptic and "died young" together. In using the first method we grouped phthisical and epileptic together. It may be objected that it is not legitimate to group in this manner, but the number of phthisical children is too small to keep them separate and for both diseases there is a distinctly greater percentage in the temperate group; it seemed therefore better to group the phthisical with the epileptic children than to group phthisis with delicate where this predominance does not occur. In the tables in the Appendix, the original numbers in the two classes are given. See Tables XVII to XX inclusive.

	Correlation ratio, η†	Correlation coefficient, r, by fourfold table
Drink of father and health of son	·07	−·06
Drink of father and health of daughter.....	·12	−·04
Drink of mother and health of son.....	·14	−·07
Drink of mother and health of daughter ...	·15	−·03

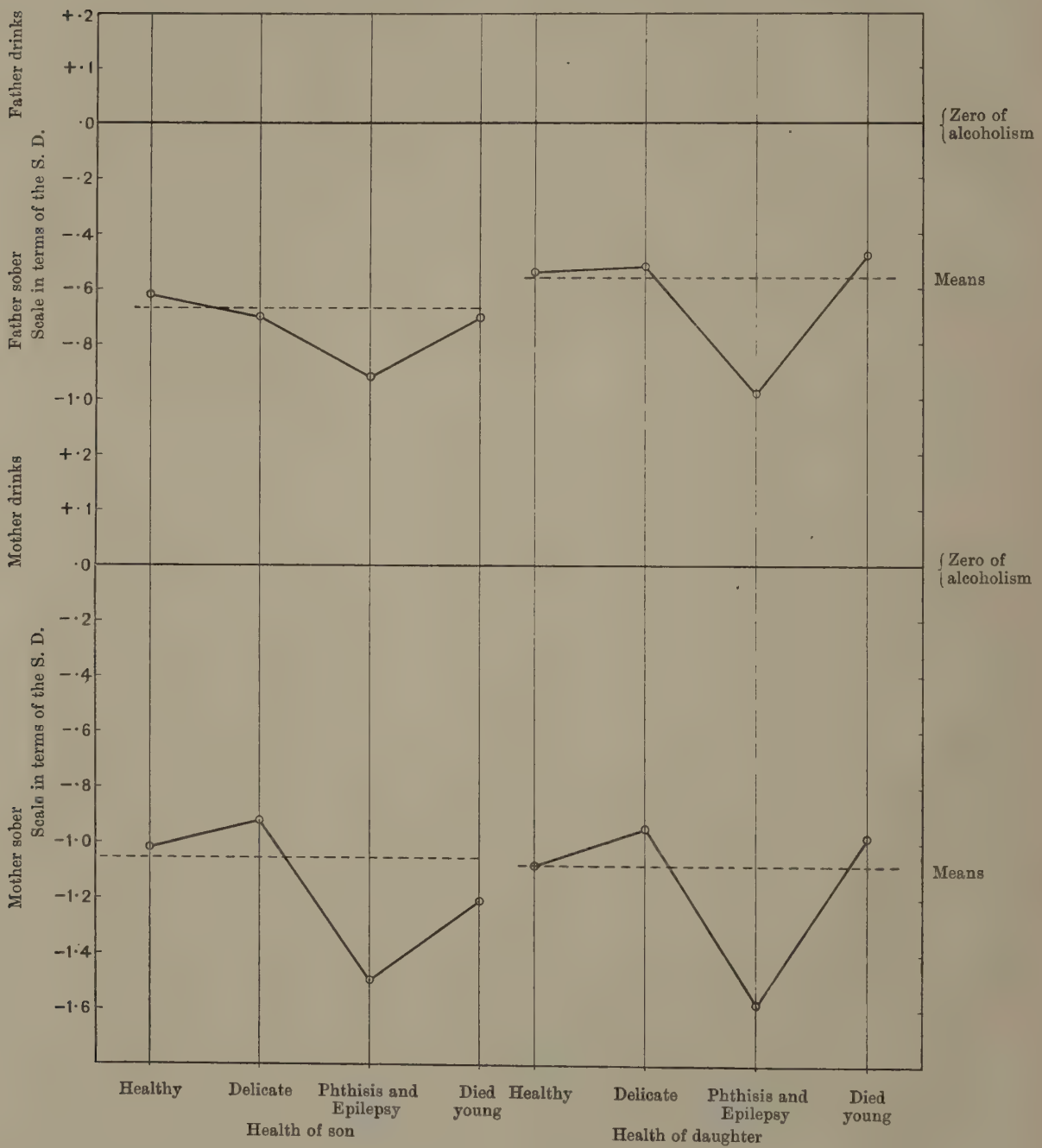
An examination of the curves on p. 10 will indicate the source of the divergence in the results by the two different methods. These curves show the mean alcoholism of the parents for each grade of health (intelligence, etc.), in the children measured by the deviation from the dividing line between alcoholic and sober parents. The dividing line is drawn in each case; the further below this line any point is situated the more sober is the parent and the deviations will have a minus sign; the further above this line the more drunken is the parent and the deviations will be positive. The vertical scale is measured in terms of the Standard Deviation. The dotted line shows the average amount of alcoholism in all the parents of the children under consideration. Sobriety is thus on the diagrams a negative alcoholism. The average Manchester and Edinburgh mothers are sober, the average Manchester father is also sober, but not the average Edinburgh father. The standards of the recorders have, of course, to be allowed for, but there is good reason to believe that the Edinburgh

* Vol. VII. p. 248: "On a New Method of determining Correlation, when one Variable is given by alternative and the other by multiple Categories."

† The reader will bear in mind that the correlation ratio has no sign by its nature and is only equal numerically to the correlation coefficient when the regression is linear.

population is really as well as apparently more alcoholic than the Manchester. It will be seen that it is the dip into the sober class of parent of epileptic and phthisical children which is the source of the higher value found for η, and in the only case where this dip is slight the two values found by η and the fourfold method agree well numerically. The number of phthisical and epileptic children is comparatively few and we should probably be nearer the truth if we take the lower values given by the fourfold method for the influence of drink on general health. The value found is negative,

FIG. 1. PARENTAL ALCOHOLISM AND HEALTH OF CHILDREN (MANCHESTER).



that is to say, parental intemperance is not associated with relatively worse general health in the children but a coefficient even of ·07 with a probable error of ·03 is not really significant, and we should say that as far as these statistics go there is no general association between parental alcoholism and defective health in the children. The nature of the interrelationship is far more subtle than we think many temperance advocates have realised. The fact, as shown in these figures, that the children of the intemperate are healthier than the children of the sober is probably due to the more virile and physically fit members of the community being liable to alcoholic temptation, and is as such an indirect effect of heredity and not a result of alcohol. The greater percentage of phthisical and epileptic children in the families of the sober is again probably due to the same source; i.e. these pathological conditions arise from inherited constitutions, and the parents of phthisical and epileptic children being themselves of a feebler constitution than average parents are less liable to alcoholism. It may further be noted that in the case of children dying young, while for sons the parents of both sexes are more sober than the average, for girls they are more alcoholic than the average; this appears to mark the result as due to an environmental rather than a toxic influence, and corresponds to what we have noticed in the relation of weight and height of children to parental alcoholism. Taking health as a whole we are compelled to say, that—excepting that phthisis and epilepsy occur less frequently with alcoholic parents—there is no significant association between parental alcoholism and defective health in the offspring. The differences are far too slight to permit of safe conclusions being drawn, and there is no intense and close relation between alcoholism and defective health or pathological condition in the offspring.

(ii) *Edinburgh.* We may now consider how far the data obtained from the Manchester special schools receive confirmation from other sources, and we turn to the data collected by the Edinburgh C.O.S. to find independently the relation between the drinking of the parent and the health of the children. In the Edinburgh report the general health is not stated for each child but the diseases from which each child suffers are given and upon this we are able to divide the children into various classes, i.e. healthy, suffering with glands (tubercular glands were kept separate), epileptic, phthisical, weak chests, rickets, weak hearts, eczema, etc.; there were not sufficient cases to keep all these categories separate and we have had to content ourselves in the first place with making three divisions, i.e. (1) healthy, (2) suffering from glands, (3) suffering from other diseases. The percentages are given in the four tables below of children divided into these three classes; the drinking of the parents is also divided into three classes: Parent (1) sober, (2) drinks, (3) drinks in bouts.

Drinking in bouts seems to be much less frequent among mothers than fathers and the numbers in that class are rather too small to give regular results. Two facts seem to be clear from these tables: (1) the larger percentage of children suffering with glands when the parents drink in bouts and (2) the larger percentage of children suffering from "other diseases" when the parents are sober. The associations worked out by contingency are Father and son ·11, Mother and son ·12, Father and daughter,

·05, Mother and daughter, ·14. Here again it is extremely difficult to tell what the sign should be and in order to ascertain it we divided the "other diseases" into three classes, those suffering from (1) heart, (2) chest and bronchial troubles, (3) other diseases which include rickets, eczema, curvature, delicacy, etc. and, in order to have a sufficient number of cases on which to base means, the two sexes were put together and the correlation ratios worked out for father and child and mother and child by the recently published method* The correlation ratios were ·14 in each case but an examination of the means shows a curious difference. In the case of the mothers the means show a general downward tendency which indicates an increasing number of children suffering from heart, chest and other diseases in the sober class of mothers; but when we examine the curve for fathers we see an upward slope of the curve into the drink class except for "other diseases" when there is a very decided drop into the

Father

Son	Sober	Drinks	Bouts
Healthy	31·6	32·9	27·3
Glands.....	40·2	39·6	50·0
Other diseases...	28·2	27·4	22·7

$C = ·11$

Father

Daughter	Sober	Drinks	Bouts
	32·1	31·9	29·2
	43·5	45·4	50·0
	24·4	22·7	20 8

$C = ·05$

Mother

Son	Sober	Drinks	Bouts
Healthy	32·1	30·2	25·5
Glands.....	39·2	47·3	55·3
Other diseases...	28·7	22·5	19·1

$C = ·12$

Mother

Daughter	Sober	Drinks	Bouts
	28·4	35·9	19·4
	42·5	46·4	50·0
	29·1	17·6	30·6

$C = ·14$

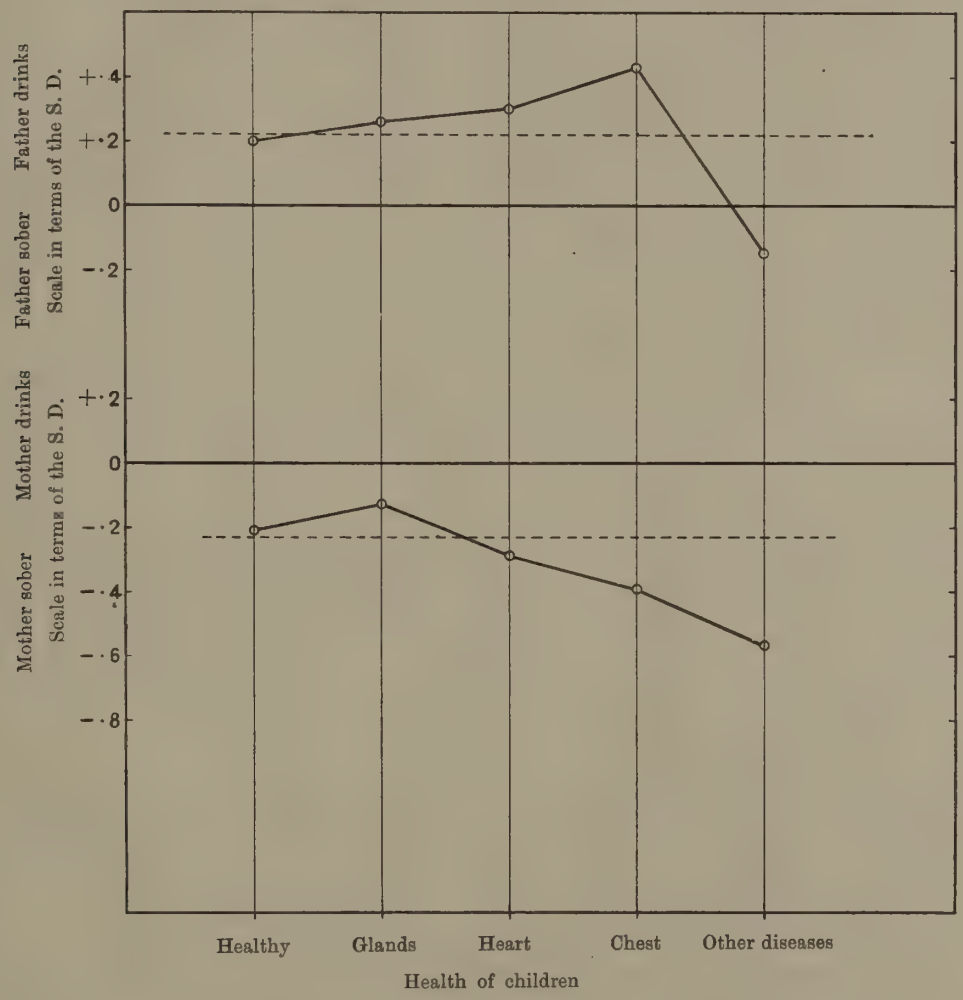
sober class of fathers. It is very difficult to trace definite relationships here; they are too slight in character to be really significant on the basis of the numbers dealt with; they seem to be different for parents of the two sexes and again for offspring of the two sexes. The only definite conclusion that can be drawn is that there is no close and simple relation between parental alcoholism and defective health in the children, which can be ascertained from a sample of moderate size of the general population. There may exist slight and complex relations as indicated by the fact that "other diseases" show a significant tendency to be associated with parental sobriety rather than with parental alcoholism.

(6) *Parental Alcoholism and Intelligence of Children.* See Tables XXV to XXXV inclusive in the Appendix. First we will consider the results obtained from the Manchester special schools. In this case we could only divide the children into

* See footnote p. 9.

(1) mentally defective and (2) normal. There were a small number of children who were very dull, without apparently being actually defective, but these we included in the mentally defective category as they were certainly not normal, but the number of them being only 1 per cent. of the whole number of children the transference from one group to the other would make practically no difference to the correlation coefficient. The percentages tables are given on p. 14, and the correlation coefficients worked by the fourfold method, the only available method in this case, are given below each table.

FIG. 2. PARENTAL ALCOHOLISM AND HEALTH OF CHILDREN (EDINBURGH).



Of the four tables three show a negative correlation, that is to say a correlation between temperate parents and mentally defective children; the correlation coefficients are too small to be of great significance but they show very clearly that the statement that intemperance in the parent causes mental defect in the children must be received with caution; it is not the case among the defectives in Manchester. When the father is temperate we find 41 per cent. of his sons and 31 per cent. of his daughters

are mentally defective, which must be compared with 34 per cent. and 30 per cent. when he is intemperate. When the mother is temperate we find 39 per cent. of her sons and 30 per cent. of her daughters are mentally defective, which must be compared with 40 per cent. and 24 per cent. when the mother is intemperate. Here again we must repeat that we do not suppose temperance to be a cause of mental defect any more than we supposed it to be a cause of phthisis or epilepsy. The small association, if it be significant, is probably a secondary effect of an hereditary influence, the mentally defective children coming from a feebler stock, which has not the desire or possibly the capacity for alcohol of a stock of a more vigorous physique.

Father

Son	Temperate	Intemperate
Normal	58·8	65·8
Mentally defective	41·2	34·2

$-\cdot11$

Father

Daughter	Temperate	Intemperate
Normal	69·2	70·5
Mentally defective	30·8	29·5

$-\cdot02$

Mother

Son	Temperate	Intemperate
Normal	60·8	60·0
Mentally defective	39·2	40·0

$\cdot01$

Mother

Daughter	Temperate	Intemperate
Normal	69·9	75·8
Mentally defective	30·1	24·2

$-\cdot08$

The above data are of course selected, they only show the relationship of alcohol and mental defect within families, one member at least of which is mentally defective.

We shall next deal with the non-selected data obtained from the Edinburgh school. As before we will first give the table in the form of percentages, and the association found by the two methods of contingency and of the correlation ratio is placed below each table.

In examining the tables it must be remembered that children with "excellent" intelligence are few in number and we shall consequently find some irregularity in this class, and as those parents who drink in bouts are fewer in number than either "sober" or "drinkers" so we shall find more irregularity in the percentages in the bout class. It is probably due to the smaller numbers that we find in the first table, 12 per cent. "excellent" boys when the father drinks in bouts, while there are only 3 per cent. of "excellent" girls in the second table. As far as the sober and drinking parents are concerned we find that excellent intelligence in their children is very evenly divided; there is a slight excess of excellent intelligence among the sons of temperate fathers but in the other three cases we find a slight excess of excellent intelligence among the children of drinking parents. When we examine the percentages of children with good intelligence we find a slight excess of good intelligence among the sons of drinking parents and a slight excess of good intelligence among the daughters

of non-drinking parents. In the category of dull and defective intelligence we find an excess among the sons of sober fathers and in the other three tables we get the excess of dullards in the children of drinking parents. The differences throughout are slight and irregular and the correlation coefficients are only just significant. In this case as in the case of health we worked the tables a second way and found η and plotted the mean deviations in order to find what sign to attach to these values—drinkers and bout drinkers were classed together. The values for η are given below those found by contingency, and it will be seen that the correlations are scarcely significant.

Father

Son	Sober	Drinks	Bouts
Excellent	7·9	5·4	12·5
Good	37·3	39·0	30·7
Medium.....	34·7	38·1	42·0
Dull and defective...	20·1	17·4	14·8

$C = \cdot 14$
$\eta = \cdot 07$

Father

Daughter	Sober	Drinks	Bouts
	6·0	6·3	3·3
	34·7	34·6	41·3
	41·7	38·5	38·0
	17·6	20·5	17·3

$C = \cdot 09$
$\eta = \cdot 05$

Mother

Son	Sober	Drinks	Bouts
Excellent	5·8	7·4	5·2
Good	37·9	40·1	43·1
Medium.....	37·2	34·0	32·8
Dull and defective...	18·1	18·5	19·0

$C = \cdot 08$
$\eta = \cdot 05$

Mother

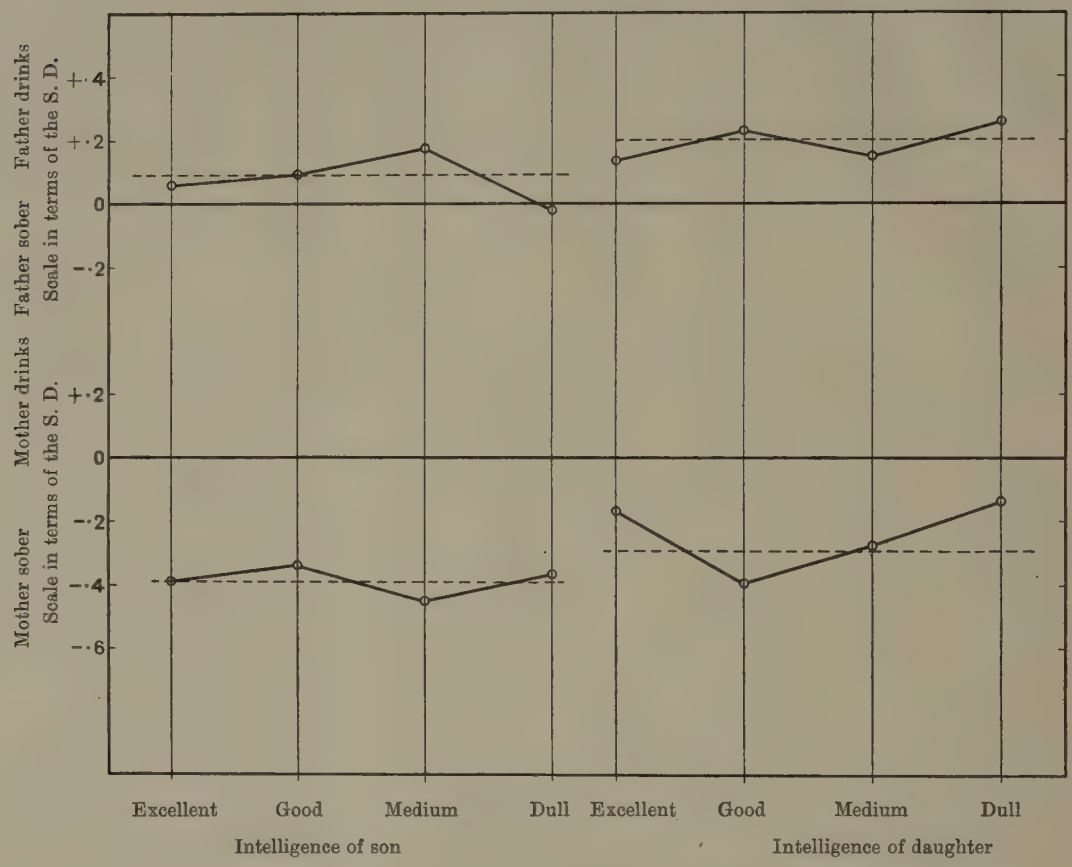
Daughter	Sober	Drinks	Bouts
	5·0	5·7	7·7
	39·4	33·0	33·3
	38·2	40·3	33·3
	17·4	21·0	25·6

$C = \cdot 09$
$\eta = \cdot 09$

It is almost impossible to determine whether the slight relationship noted above is to be considered positive or negative, i.e. whether temperance or intemperance of parents is associated with good intelligence in the offspring. We can bring this home to the reader in two ways. First the material was divided into four fourfold tables, the parents were divided into sober and drinking, the offspring into two groups excellent with good, and medium with dull. It was found that alcoholism of the parent went with the better intelligence of the offspring in the cases of father and son and mother and daughter, while in the cases of father and daughter and mother and son the reverse was the case. Even if any weight could be given to the extremely small correlations the difference of sign in the four correlations precludes our asserting any marked and simple relationship. Secondly the accompanying diagrams indicating the average alcoholic tendency of the parent of each class of child, obtained by Pearson's new correlation ratio method, show how small is the trace of any significant relation between parental alcoholism and filial intelligence—the deviations bear wholly the

impress of irregularity due to random sampling. The truth seems to be that there is no marked relation whatever between filial intelligence and parental alcoholism.

FIG. 3. PARENTAL ALCOHOLISM AND INTELLIGENCE OF CHILDREN (EDINBURGH).



(7) *Parental Alcoholism and Filial Eyesight.* Although on first consideration the reader may imagine the association of these characters is not a fruitful field for inquiry, it will ultimately be seen that there is much to be said about it, and that it opens up several lines of related investigation of peculiar interest. For example, the alcoholism of parents if productive of general degeneracy in the children, would be likely to be marked by defective filial eyesight. Again, alcoholic parents are peculiarly likely to neglect the cleanliness and care on which the hygiene of the eye largely depends. Further alcoholism in the home may drive the children out of doors, and thus even produce an environment favourable to the eyesight. Shortly there is no field in which, on a little careful consideration, it will be realised that we are likely to have such an interplay of the three fundamental influences of alcohol, the hereditary, the toxic and the environmental, as in the problems concerning filial eyesight and parental alcoholism. We have again in this case also very reliable medical data for the children's eyesight. These data concern (1) Refraction, (2) Acuity of Vision and (3) Diseases of the Eye and are drawn from the Edinburgh C.O.S. Report. In the first two cases,

Refraction and Acuity, we know that there is increasing defect with increasing age*. It is hardly likely, however, that the third case, Diseases of the Eye, will be much affected by the difference in average age of the children of alcoholic and non-alcoholic parents. Since the children of alcoholic parents are slightly older than those of sober parents†, we might expect on this ground alone their eyesight to be slightly worse,—and this quite independent of alcoholism.

Our first investigation will deal with the influence of parental alcoholism on filial refraction, and as before we give below the fundamental Tables (Appendix Tables XXXIII to XXXVI inclusive) in the form of percentage tables. The mean square contingency of the original tables is attached below the percentage tables. We see at once that the association, whatever analysis may show of its actual nature, is more uniform *numerically* and on the whole more substantial than those we have yet come across. It must be remembered in considering these tables that the actual numbers of children falling in the mixed astigmatism, myopic astigmatism and myopia classes are small, and that accordingly we must anticipate irregularities in our results.

Father

Son	Sober	Drinks	Bouts
Normal	59·6	74·2	63·3
Hypermetropia	20·7	12·4	17·9
Hyper. astigmatism	12·4	7·3	10·6
Mixed astigmatism	4·3	3·8	3·2
Myopia and myopic astigmatism	3·0	2·3	5·0

$C = \cdot 15$
$\eta = \cdot 13$

Father

Daughter	Sober	Drinks	Bouts
Normal	57·1	61·8	57·7
Hypermetropia	17·6	16·6	15·9
Hyper. astigmatism	13·9	16·6	15·9
Mixed astigmatism	6·3	2·7	5·5
Myopia and myopic astigmatism	5·1	2·4	4·9

$C = \cdot 11$
$\eta = \cdot 10$

Mother

Son	Sober	Drinks	Bouts
Normal	64·5	72·0	59·6
Hypermetropia	15·7	13·0	23·7
Hyper. astigmatism	11·4	12·4	9·6
Mixed astigmatism	4·2	1·2	4·4
Myopia and myopic astigmatism	4·2	1·2	2·6

$C = \cdot 16$
$\eta = \cdot 14$

Mother

Daughter	Sober	Drinks	Bouts
Normal	58·1	65·5	61·8
Hypermetropia	16·7	13·9	6·6
Hyper. astigmatism	15·2	13·0	15·8
Mixed astigmatism	6·6	4·5	9·2
Myopia and myopic astigmatism	3·4	3·0	6·6

$C = \cdot 13$
$\eta = \cdot 10$

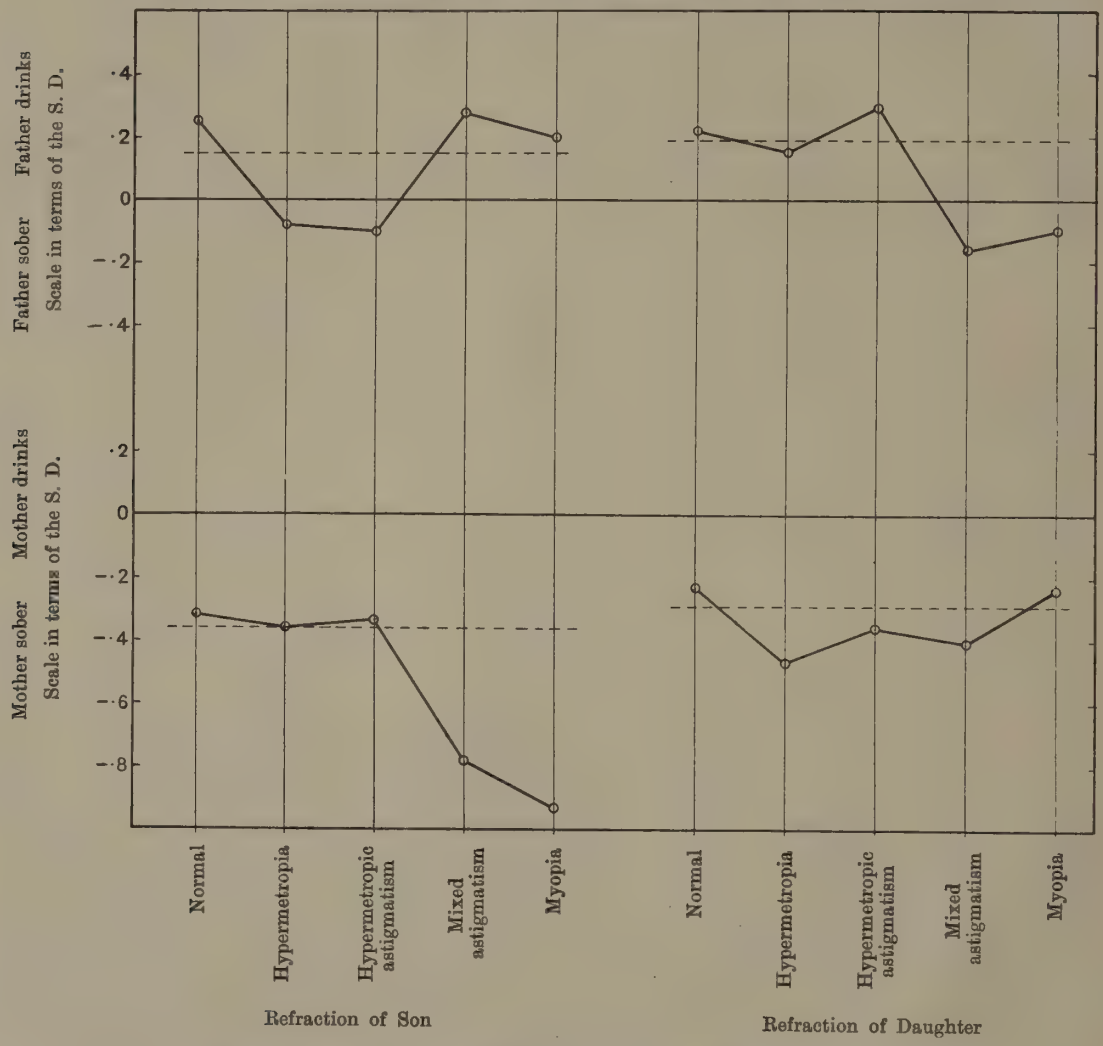
On examining these tables in the first instance we will leave the "bouts" out of the question and consider only the percentages of the different kinds of eyesight of

* "A First Study of the Inheritance of Vision and of the Relative Influence of Heredity and Environment on Sight." By Amy Barrington and Karl Pearson, F.R.S., *Eugenics Laboratory Memoirs*, Dulau & Co., 1909.

† This is probably due to the fact that some parents become more definitely alcoholic with age.

the child of the sober and drinking parents. Two facts are common to all four tables (1) the larger proportion of normal eyes among the children of drinking than among those of sober parents, (2) the larger proportion of children suffering from mixed astigmatism, from hypermetropia and from myopia and myopic astigmatism among the sons and daughters of sober parents. The only class of eyesight that shows any irregularity in the percentages is the hypermetropic astigmatism; in two cases we find a greater percentage of this eye defect in the children of sober parents and in two cases in the

FIG. 4. PARENTAL ALCOHOLISM AND REFRACTION OF CHILDREN (EDINBURGH).



children of drinking parents. If we leave "bout drinkers" out of the question there is no doubt that the correlation, small though it is, is negative and that temperance in the parents is associated with defective refraction in the children. When we consider the children of bout drinkers we find considerably more irregularity; in three cases out of four the percentage of normal children lies between the percentages found for sober and drinking parents, in the fourth case, that for mother and son, the per-

centage of normals is lower than the percentage found in the sober class, and in this same table there is a big increase in the number of children falling in the hypermetropic category; we find 24 per cent. as compared with 16 per cent. among the sons of sober and 13 per cent. among the sons of drinking mothers. In the case of bouts, however, the entries in some of the categories are too small to give reliable results. We next calculated η and for this purpose grouped drinking and bout drinking parents together; the values found for η will be seen to agree very well with those found by contingency.

The deviations from the mean, as shown in the curves on page 18, exhibit the results in another form. In two cases there is no doubt about the sign, it is negative, and temperance in the father is associated with worse eyesight in the daughter and temperance in the mother with worse eyesight in the son; and we think we must also consider the sign to be negative in the case of mother and daughter; the downward slope is not so obvious because of the upward direction in the myopia class, but even with this slope it does not reach so far into the drinking class as the mean parents of the normal children. Throughout the relationships are really small and clearly not simple in character so that not much stress can be laid on them; but as far as they go they show no definite and marked connection between intemperance and bad eyesight—the connection, if any, is rather between intemperance and good sight.

Before discussing this result further we may turn to the effect of the parents drinking on the acuity of vision of their children (Tables XXXVII to XL inclusive in the Appendix).

Father

Sons	Sober	Drinks	Bouts
6/6	66·1	77·1	67·9
6/9 and 6/12	20·5	11·7	14·7
6/18	10·2	6·5	11·9
Rest	3·1	4·7	5·5

$C = \cdot 14$
$\eta = \cdot 15$

Father

Daughters	Sober	Drinks	Bouts
6/6	63·8	64·6	67·5
6/9 and 6/12	21·3	21·2	16·9
6/18	9·7	10·1	9·0
Rest	5·3	4·2	6·7

$C = \cdot 11$
$\eta = \cdot 09$

Mother

Sons	Sober	Drinks	Bouts
6/6	68·6	74·5	65·5
6/9 and 6/12	16·5	13·6	14·5
6/18	10·0	6·8	14·5
Rest	4·9	5·0	5·5

$C = \cdot 10$
$\eta = \cdot 05$

Mother

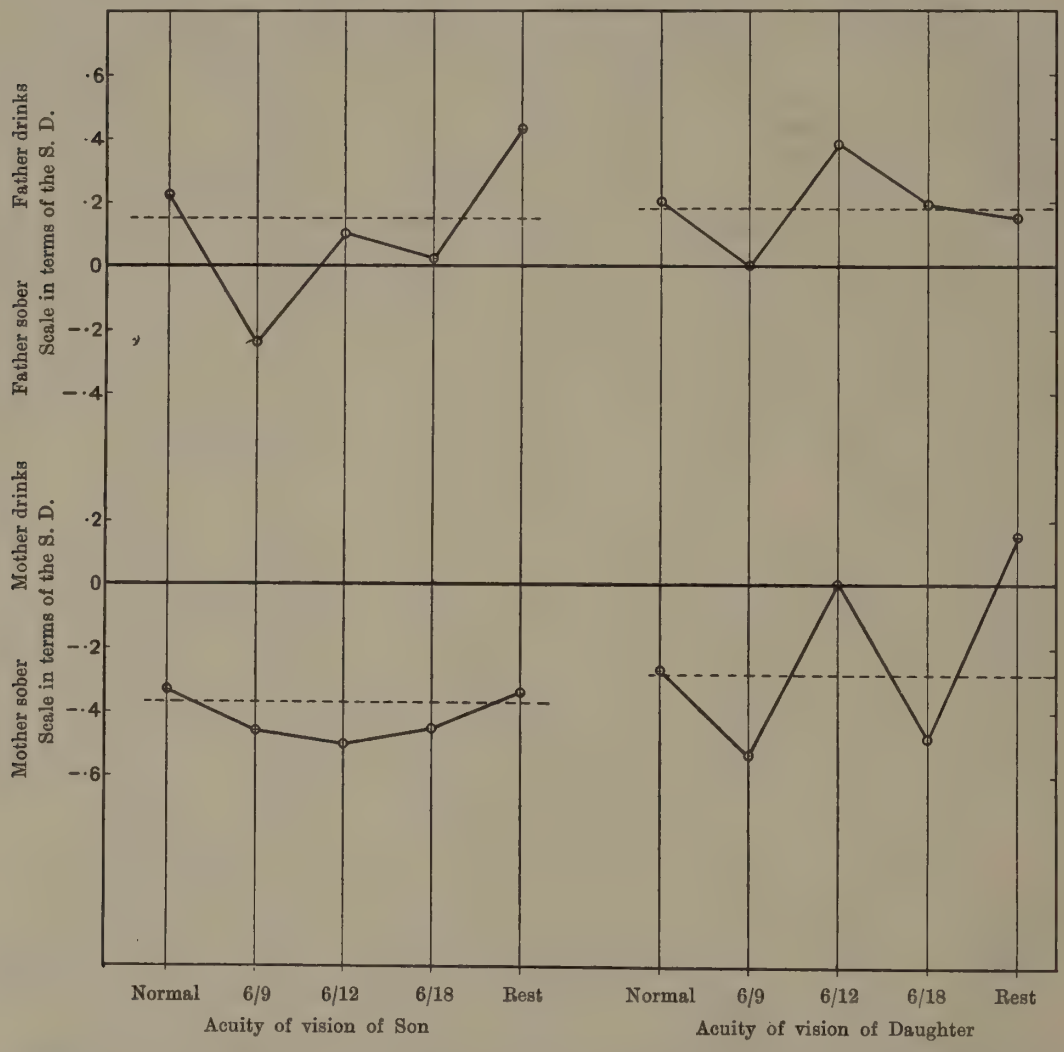
Daughters	Sober	Drinks	Bouts
6/6	64·9	67·1	61·5
6/9 and 6/12	20·9	19·8	17·9
6/18	10·8	7·8	7·7
Rest	3·4	5·3	12·8

$C = \cdot 14$
$\eta = \cdot 11$

The difficulty is again the small number of cases of the most defective vision class, including vision measured from 6/24 etc.; there are only 25 to 30 cases and percentages

or means worked on so small a number may be very misleading. As in the case of refraction we find from these tables a larger percentage of normal eyesight among the children of intemperate parents (leaving bout drinkers out of the question) than among the children of temperate, and we find a larger amount of eyesight of 6/9 and 6/12 among the children of temperate parents. When we consider the worst kinds of eyesight the results are most irregular. In three out of four tables we get a larger proportion

Fig. 5. Parental Alcoholism and Acuity of Vision of Children (Edinburgh).



of eyesight of 6/18 among the children of sober parents and in two out of four tables we get a larger proportion of the most defective eyesight also among the children of sober parents. It is quite obvious that if we divided the eyes into normal and defective we should have a negative correlation, and as in the case of refraction the association would be between the drinking parent and normal acuity of vision. The values found by η are given below those found by contingency and agree fairly well with them. If we examine the graphs of the means above we see great irregularity—this

is doubtless owing in part to the small number of cases of some types of vision—6/12 and what we have called the "rest" being based on from 25 to 40 cases only.

There is a similarity between these curves in some respects; we find that in all four the normal eyesight is above the mean, i.e. is getting into the "drinking" class of parents, and that eyesight measured by 6/9 in all four cases dips down into the sober class of parents; except in the case of mother and son eyesight of 6/12 is getting back into the drinking class and 6/18 dips again into the sober. In father and daughter the worst type of vision is found to be still further in the sober class, but for father and son and mother and daughter the worst type of vision is found comparatively high up among drinking parents. It is extremely difficult to say that there is any general slope of the means; and there is no definite conclusion which can be legitimately drawn beyond the assertion that if acuity of vision is related to parental alcoholism, the relation must be very slight and complex in character. If we simply divide the eyes into the two classes normal and abnormal the correlations if they are to be considered significant at all are negative, or again drinking in the parents is associated with normal vision in the offspring.

(8) *Parental Alcoholism and Eye Disease.* Diseases of the eye and eyelid were relatively few in number and no division of them into categories was statistically possible. The original tables are given as XLI to XLIV in the Appendix. Cases of strabismus presented a difficulty as these are very few, but we decided to keep them separate and work out the table as a ninefold contingency.

Father

Son	Sober	Drinks	Bouts
Normal ...	89·2	91·0	92·8
Diseased ...	6·9	5·9	5·4
Squint	3·8	3·2	1·8

$C = \cdot 07$

Father

Daughter	Sober	Drinks	Bouts
	86·2	88·0	86·8
	11·0	7·8	9·9
	2·9	4·2	3·3

$C = \cdot 08$

Mother

Son	Sober	Drinks	Bouts
Normal ...	90·7	89·7	89·5
Diseased ...	5·8	6·7	7·0
Squint	3·5	3·6	3·5

$C = \cdot 03$

Mother

Daughter	Sober	Drinks	Bouts
	87·5	86·0	94·7
	9·7	9·9	5·3
	2·8	4·1	—

$C = \cdot 10$

Drinking of the father and non-drinking of the mother are associated with normal eyes in son and daughter, and if we omit squint we shall find that the correlation between drink and eye disease is negative for the fathers and positive for the mothers. This difference may be just that due to the neglect that arises from the

existence of an alcoholic mother. But the values are very small and we think we may say that no correlation between intemperance of the parent and eye disease in the child is indicated by these data.

(9) *Influence of Home and Street Environment.* Throughout the above eye tables there is on the whole a larger percentage of normal eyes among the children of drinking parents than among the children of sober parents. The same thing was found by Barrington and Pearson when eyesight was correlated with overcrowding, bad economic condition of the home, and bad moral condition of the parents. Bad environmental conditions were found to be *slightly* associated with normal vision. "Can it be" they asked "that these bad home conditions keep the children in the streets, and so relatively away from the bad environment and in relatively fresher air*?" This same question may be asked in the case of drinking parents. Miss Barrows has investigated this point. She found (1) the correlation between the drinking of the parents and how the child spends its spare time, and (2) the correlation between the child's vision and where it spends its spare time. In the first case "where the child spends its spare time" was divided into five groups for the boys and four for the girls; the groups for the boys were (1) "house," (2) partly house, (3) house and outdoor employment or occupation, (4) partly streets, (5) streets. "Partly house" includes children who spend most of their spare time in the house and "partly street" those who spend most of their time in the streets. For the girls there was no group (3) as practically none had an "outdoor" employment. The percentages are given below. The original tables are XLV to XLVIII inclusive in the Appendix.

Father

Where Son spends his spare time	Sober	Drinks	Bouts
House	46·2	34·2	29·9
Part house	14·3	8·1	8·5
House and outdoor occupation	12·5	8·1	12·8
Part street	11·5	12·6	12·0
Street	15·4	36·9	36·7

$C = \cdot 25$

Mother

Son	Sober	Drinks	Bouts
	44·4	28·9	27·3
	12·9	9·6	9·1
	13·4	6·6	7·6
	11·2	12·0	16·7
	18·1	42·8	39·4

$C = \cdot 27$

Father

Where Daughter spends spare time	Sober	Drinks	Bouts
House	56·6	47·8	44·0
Part house	15·3	9·4	16·5
Part street	11·1	18·2	16·5
Street	17·0	24·6	23·1

$C = \cdot 16$

Mother

Daughter	Sober	Drinks	Bouts
	57·3	43·9	41·9
	14·0	12·8	16·3
	15·5	13·3	16·3
	13·2	30·0	25·6

$C = \cdot 20$

* "Inheritance of Vision and of the Relative Influence of Heredity and Environment on Sight." By A. Barrington and K. Pearson, p. 55.

FIG. 6. ACUITY OF VISION AND WHERE CHILD SPENDS ITS SPARE TIME (EDINBURGH).

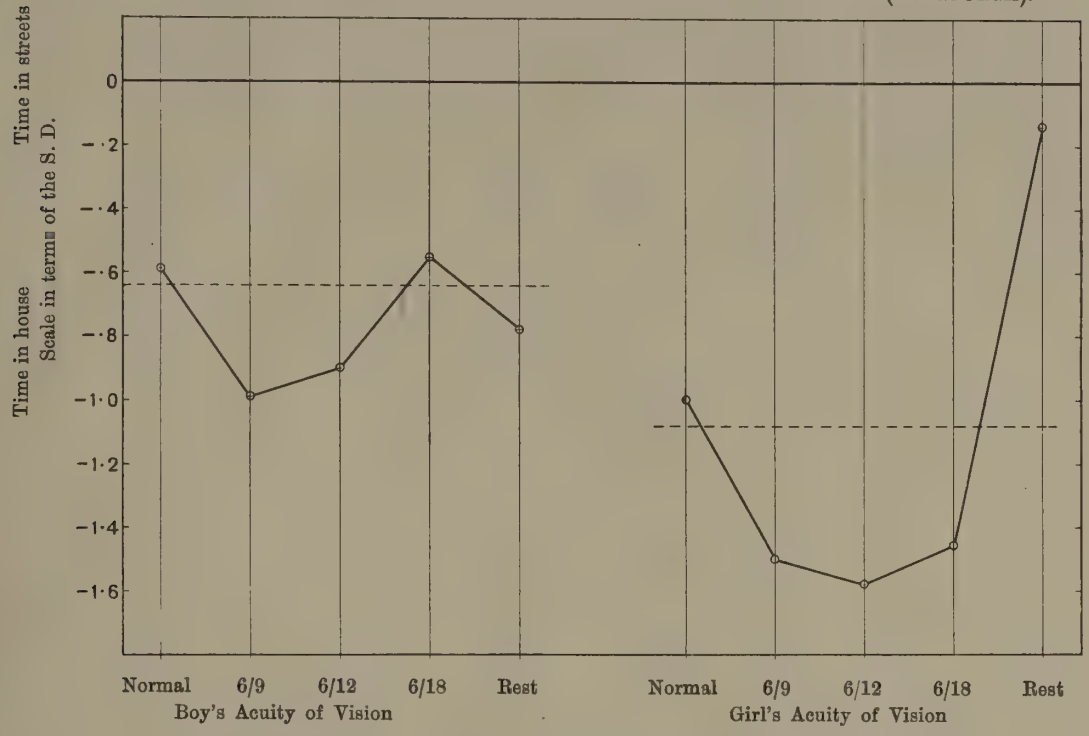
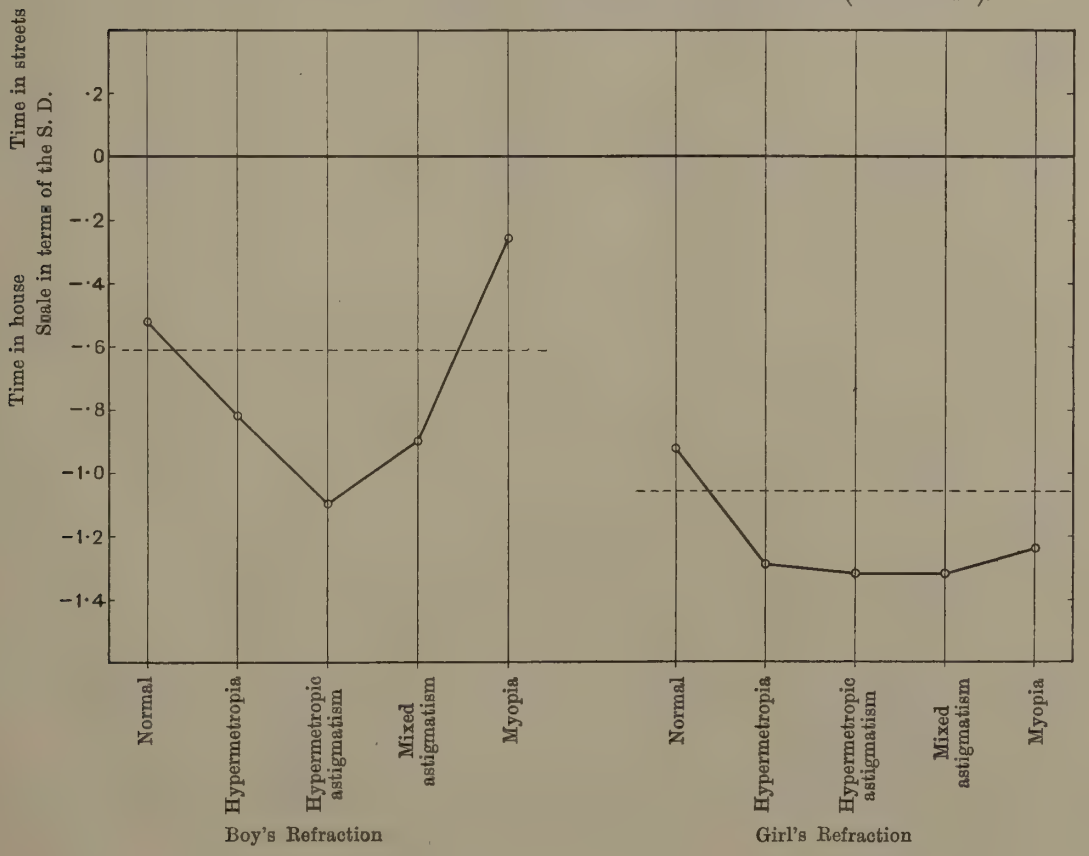


FIG. 7. REFRACTION AND WHERE CHILD SPENDS ITS SPARE TIME (EDINBURGH).



From these percentages it is clear that there is a quite considerable connection between the drinking of the parents and the fact that the child spends its time in the streets. Alcoholic parents drive the child out of doors. The correlations show that the mother's drink is more likely to drive the child into the streets than the father's drink and that boys are more affected than girls.

We must next examine the results which Miss Barrows found between the eyesight of the child and where it spent its time (Tables XLIX to LII in Appendix).

Acuity of Vision

	Where Boy's spare time spent			Where Girl's spare time spent		
	House	Part house and part streets	Streets	House	Part house and part streets	Streets
Normal	72·2	67·4	76·3	67·1	57·8	73·3
6/9 and 6/12	14·7	18·8	9·5	18·2	30·1	9·3
Rest	13·1	13·8	14·2	14·7	12·1	17·3
	$C = \cdot16$			$C = \cdot25$		
House and part streets	$\eta = \cdot14$			$\eta = \cdot29$		
Streets and part streets	$\eta = \cdot07$			$\eta = \cdot13$		

Refraction

	Where Boy's spare time spent			Where Girl's spare time spent		
	House	Part house and part streets	Streets	House	Part house and part streets	Streets
Normal	65·6	59·2	74·6	63·1	47·4	73·3
Hypermetropia	16·4	18·8	12·4	13·3	22·5	10·7
Hypermetropic astigmatism	11·6	15·1	5·6	15·4	16·2	9·3
Mixed astigmatism	3·9	3·9	2·4	5·2	6·1	3·3
Myopia and myopic astigmatism	2·5	3·0	5 0	3·0	7·8	3·3
	$C = \cdot22$			$C = \cdot22$		
House and part streets	$\eta = \cdot21$			$\eta = \cdot19$		
Streets and part streets	$\eta = \cdot05$			$\eta = \cdot15$		

An examination of the normals in these tables reveals a curious fact. In every case the largest percentage of normal eyes is found among children who are in the streets and the smallest percentage among children who are partly in the streets and partly in the house, while those children who are kept entirely in the house come half way between. This is not at all what we should expect; if being in the streets has a good influence on children's eyes, those children who are, at any rate, partly in the streets should have better eyes than those children who are kept entirely in the house, but we find nothing of the kind. The result of this curious fact is that if we divide our tables twice over and work out η we find that if we group "house" and "part house and part streets" together we get a sensible correlation, but if we group streets and "part house and part streets" together we get practically half the correlation for the girls and boys in the acuity of vision tables and a very small one for the boys in the refraction table because we are combining the highest and

lowest percentage in each case and this gives a value very close to the middle percentage which belongs to the "house only" group.

When we look at "acuity of vision" measured by 6/9 and 6/12 we see for boys and girls the largest percentage with this type of vision in the "part streets" group, the smallest percentage in the streets, while the percentage in the house lies between the other two. We get the largest percentage of the worst type of vision in the streets and the smallest percentage in the house among the boys, and in the "part streets" group among the girls.

Of hypermetropia and hypermetropic astigmatism we find the largest percentage in the "part streets" group and the smallest in the streets; while in the last two kinds of eyesight, mixed astigmatism and myopia, there seems to be a slight excess of myopia in the streets over children in the house and it is the other way round with mixed astigmatism. The curves for refraction and vision are interesting, showing a distinct difference of myopia between girls and boys. The boys with the worst vision are found indoors, the girls with the worst vision in the streets; the boys with the most myopia in the streets, and the girls with the most myopia indoors! Thus while the normal vision and normal refraction children are mostly in the streets, the worst vision girls and the myopic boys also frequent the streets. To test whether the "street" children were the older children, and therefore the more myopic, the average ages of the house and street boys and girls were calculated. The average age of the boys who spent their spare time in the streets was found to be 9·9 years, and in the house 9·2 years. The corresponding ages for the girls were 9·4 and 9·3 respectively. The six months difference in the case of the boys' ages may possibly account for some, but not for all the difference in myopia. Possibly also some of the boys prefer street to home for their spare time because they are myopic.

It must at once be confessed that the relationships whatever they may be between street and home and eyesight are too slight and too entangled for any definite conclusions to be drawn from the present statistics. Drunkenness of parents does send the children into the streets; the children of the alcoholic parents have somewhat the best eyesight, and the children with the more normal vision and better refraction are most in the streets. But when we begin to think how we may explain the better sight of the children of parents who drink we are at once met, in this matter, by innumerable difficulties; the myopic boys are also more in the streets; the boys and girls who are partly in the streets have in all cases less normal sight than those wholly in the streets; they have also more myopia than those kept wholly in the house. Thus our correlations, which seemed to denote some significance of relationship between time in the streets and sight, are found to be the result of more than random variations, but variations of which we can give no obvious and unique explanation. Bad home environment sends the children into the streets, this is demonstrated; but greater time in the streets is not associated continuously and uniquely with better vision and refraction.

(10) *Parental Alcoholism and the Child Death Rate.* In the C.O.S. Edinburgh Report the number of dead children is given for each family but the age at death is

not given so the mortality must be considered as a general child mortality and it may even include some young adults. In each family there is one child of school age so that the upper age limit cannot be very high.

In considering the mortality of these families we must also consider the total number of children born, as the mortality will naturally vary greatly with the size of the family. To find the connection between the drinking of the parents and the child mortality we must find the partial correlation coefficient and correct our "crude" mortality for a constant size of family; this means that we must find three correlation coefficients (1) between drinking of parents and gross mortality, (2) between drinking of parents and size of family, (3) between gross mortality and size of family.

We kept the three earlier divisions of sober, drinks and drinks in bouts and found the correlation rates. The first step in the process is to find the mean for each group, that is to say (1) the mean number of dead children, and (2) the mean size of family when the parents are sober, when they drink and when they drink in bouts (Appendix Tables LIII to LVI inclusive and Table LXII).

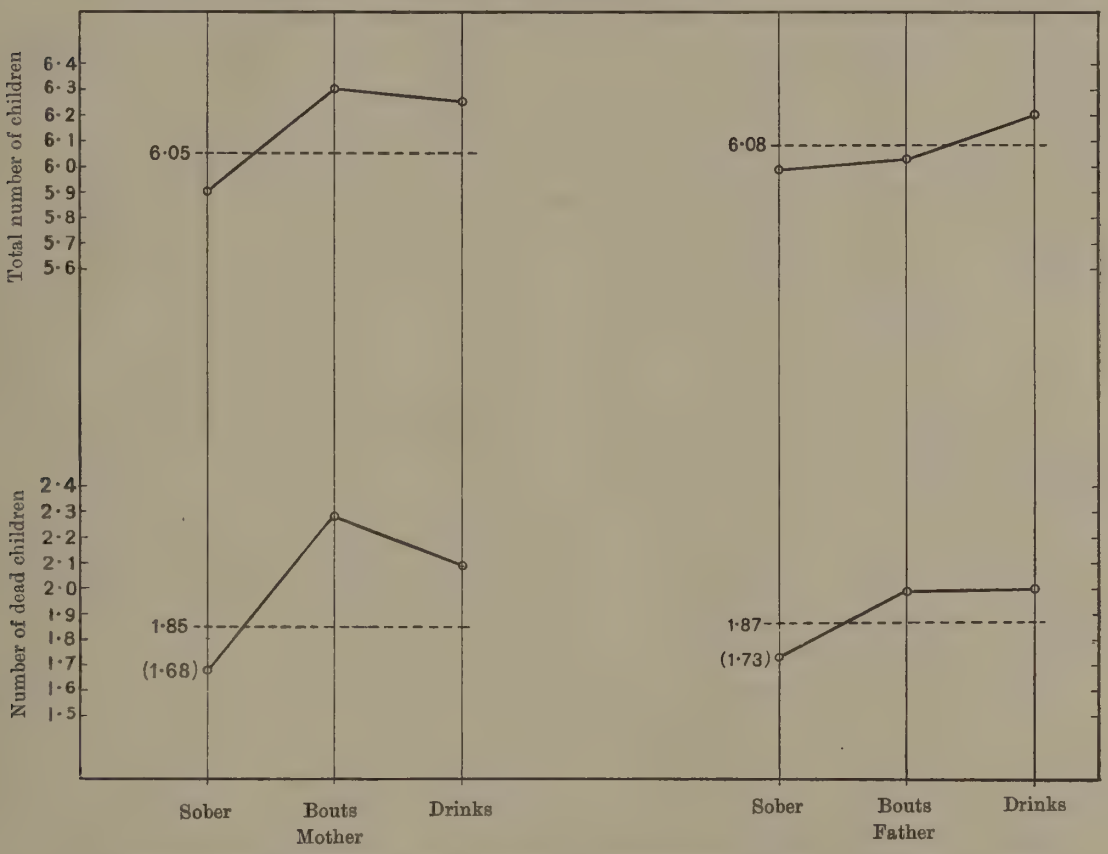
	Father			Mother		
	Sober	Drinks	Bouts	Sober	Drinks	Bouts
Average number of dead children	1·73	1·99	1·97	1·68	2·09	2·28
Average size of family	5·99	6·20	6·03	5·91	6·25	6·32
Nett family	4·26	4·21	4·06	4·23	4·16	4·04
Death rates, °/₀	28·9	32·1	32·7	28·4	33·4	36·1

These means show that sober fathers have on the average fewer dead children and smaller families than drinking fathers, and the same is true of sober mothers. These families are incomplete; whether completed families would show this difference or whether it is due to the older average age of drinking parents we cannot say; the age of the parents is not given in a sufficient number of cases to enable us to answer the question. The correlation between the father's drinking and the number of dead children is ·06 and between his drinking and the size of his family is ·04; the correlation between the number of dead children and the average size of a family in Edinburgh is ·72 and the correlation coefficient between drinking of the fathers and a child death rate for a constant size of family is ·046 ± ·027. The correlation is very small but is positive, and as far as any stress can be laid on a correlation of ·05 it signifies that the child death rate is slightly heavier when the father drinks.

When we examine the means for the mother we see that when the mother drinks the death rate is heavier and that the differences are greater, but the most noticeable difference is when the mother drinks in "bouts"; the curves on p. 27 show this very clearly. In the case of the father the death rate is almost steady between the drinking and bout drinking fathers, but in the case of the mothers there is an excess of deaths when the mother drinks in bouts. We should be inclined to attribute this excess to

misadventure. The cause of death is not given in the C.O.S. report but one would expect accidents to occur more frequently when the mother has drunken bouts—overlaying probably accounts for some of the loss of infant life. Without knowing the cause of death we cannot say that death by accident is more common among the babies of mothers who drink in bouts, but it seems to us a reasonable supposition: this marked difference does not occur between drinkers and bout-drinkers among the fathers who would have less to do with the management and handling of the babies.

Fig. 8. Parental Alcoholism and Child Mortality Rate (Edinburgh).



The correlation between the mother's drinking and the child death rate is ·12 and between the mother's drinking and the size of family is ·07, and the partial correlation coefficient between the mother's drinking and the child death rate for a constant size of family is ·11. A correlation of ·11 is definitely significant and we can say that the drinking of the mother is associated with a higher child mortality. Some of this excess of child deaths is certainly due to accident, to overlaying, to burns, and to other causes arising from carelessness, but we should be inclined to attribute it, at least in part, to the same causes, probably to want of home care, to food defects, perhaps, to other factors possibly toxic, which also show themselves in slightly less height and weight among the children of the drinking mothers when these children reach a school age.

We will now examine the child death rate in the families of the mentally defective

in Manchester (Tables LVII to LXI in the Appendix). It must be remembered that this is a highly selected population. In this case the parents are only divided into temperate and intemperate, and the number of intemperates among the mothers is small, only 64 out of a total of 453 mothers, about whom a definite statement is made, being called intemperate. Either Manchester mothers are more temperate than Edinburgh mothers, which is possible, or temperate mothers are more numerous among the mothers of defective children or, in considering the mothers of Manchester children, only those mothers who are *very* intemperate have been included. It must be remembered therefore that our results are based on only 64 cases of intemperate mothers.

	Father		Mother	
	Sober	Drinks	Sober	Drinks
Average number of dead children	1·48	2·25	1·55	2·14
Average size of family	5·70	6·71	5·84	6·34
Nett family	4·32	4·46	4·29	4·20
Death rates, °/₀	25·8	33·5	26·5	33·8

The means show, as we found in Edinburgh, that the number of dead children is greater when the father or mother drinks and that the size of family is also greater. The correlation coefficient* between the father's drink and child death rate in Manchester is ·23, between the father's drink and size of family is ·19 and between the child death rate and size of family is ·75, and the partial correlation between the father's drink and child death rate for a constant size of family is ·13 ± ·03. This is a distinctly higher value than we found in Edinburgh.

The correlation coefficient between the mother's drinking and the number of dead children was ·17, between the mother's drinking and the size of family ·09, and the correlation between the drinking of the mother and the child death rate for a constant size of family was found to be ·15 ± ·03. These coefficients of ·13 and ·15 are large in comparison with most of the coefficients with which we have been dealing but come low in any general scale of correlations. They are certainly significant and show a connection between the drinking of the parents and a higher child mortality, which is slightly greater when the mother drinks than when the father drinks.

It is of interest to note how very little difference there is between the nett family of alcoholic and sober parents, and between the nett Manchester and Edinburgh families. Taking the difference in mortality rate of children of sober and alcoholic parents for Manchester we find that 11 °/₀ of children who die, die under the increased death rate in the children of alcoholic over sober fathers and 5 °/₀ under the increased death rate in the children of alcoholic over sober mothers†. The correlation between

* For method of working see *Biometrika*, Vol. VII. pp. 96 et sqq.

† The alcoholism of the mother produces more effect than that of the father, but the number of alcoholic mothers is far fewer. Hence the smallness of the 5 °/₀ as compared with the 11 °/₀.

alcoholism in husband and wife is large, roughly about ·7, hence these percentages are not independent. We shall err in excess if we put the total increased death rate at 13°/₀ *among the stocks which produce the feeble-minded in Manchester.*

Among the Edinburgh sample of the general population the corresponding numbers are 7·7°/₀ and 5·5°/₀, the lesser alcoholism of the mothers in this case producing a relatively greater effect. The total increased death rate can thus hardly exceed 10°/₀. The results for Edinburgh and Manchester seem to indicate that from the general population to a special degenerate class—the parents of feeble-minded children—the excess death rate due to alcohol ranges from 10°/₀ to 13°/₀ of the deaths. These results seem hardly in keeping with a current statement that 25°/₀ of the deaths of children below the age of five years are due to intemperance. The percentage is large enough without any exaggeration. But it is no paradox to assert that if the alcoholists became sober the nett gain in child life would not even be 10°/₀ to 13°/₀ but scarcely 1°/₀, because the alcoholic parents are more fertile than the sober, and so their nett families are almost the same. Those who assert that the increase of the population would be 25°/₀ more rapid but for alcoholism have overlooked the question of the *nett* fertility of alcoholic parents.

Summary of Conclusions. When characters are closely related, or their correlations high, then it is well known that the probable errors of these relationships will be small, and even when we deal with moderate samples the relationships will stand out significantly and without confusion. All work hitherto undertaken in the Galton Eugenics Laboratory to measure the relationship between home environment and characters in children has shown low correlations, values in fact lying between ·0 and ·2 numerically. Such slight values, especially on the relatively small samples at present available, must lead to doubt and obscurity; the variations due to random sampling are of the same order as the quantitative relations we wish to disentangle. There may be some association between environment and human characters, but its order if measured by such correlations is so slight that it cannot be effectively dealt with on the basis of the samples available. This has been the case with Barrington and Pearson's investigations on the influence of home environment on sight, with Heron's work as to unfavourable home conditions and intelligence, with Elderton's inquiry into the influence of parental occupation on the intelligence and physique of offspring. It has been the case also with a number of subsidiary inquiries undertaken in the Laboratory on similar points. We seem forced to admit either that for the types of environment dealt with this influence is very small, or that the data are completely untrustworthy. Yet the several sets of data which independently lead to these conclusions have been collected at a number of different centres, London, Manchester, Glasgow, Aberdeen, Edinburgh, and by quite different systems and with different observers. In every case the inquiry has been carried out by trained social workers, and the medical observations have been planned and recorded by medical men of special knowledge and enthusiasm for their task. Difficulties of reduction and interpretation there have been and must always be. But, if we are to consider these inquiries and records of no service, then while it may be possible now on the basis of

this experience to organise more complete and in some respects more efficient surveys, it is really hopeless to suppose that new surveys will so surpass the old in accuracy, that we shall get not only substantially better, but wholly diverse results from their analysis. It seems more reasonable to believe that our difficulty lies elsewhere, that in seeking to measure environmental influence, we are not failing to find a large factor in human development owing to the carelessness of our record, but rather that we are failing to discover it, because it needs a statistical microscope for its examination. It is not a large but a small factor, and therefore requires larger samples than are at present available to measure its effects clearly and definitely. Our work in the Laboratory does not demonstrate that there is no environmental influence, but only that it is too small to be safely disentangled from the limited observations at present recorded. This appears to us to be the reasonable attitude to take. If the critic replies that our phases of the environment factor registered in other ways would indicate large environmental effects, we think we are justified in suggesting that the onus of collecting the material and reducing it now lies upon him. It must be remembered that observations of much the same nature as we have been dealing with do show high correlations, when we investigate hereditary influence. We are not able therefore to say that low correlations due to haphazard observation are essential to such surveys. Judged by practically the same or the same type of inquiry the hereditary factor appears on the average 4 to 10 times as potent as the environmental factor.

There is another point also which appears of much moment. The records with which we have dealt were not made by collectors pledged to any programme of reform. There is no evidence that they were in the least intended to illustrate the points of inquiry we have had in view. No one can believe that Miss Dendy and Dr Ashby made a record of the families of the Manchester mentally defectives with the bias that parental alcoholism would have no effect on the intelligence and health of the offspring; no one will suspect Dr Kerr and the officers and teachers of the London Educational Committee of collecting data with the *a priori* view of demonstrating that nutrition and cleanliness had small influence on the mental capacity of the children committed to their charge; none will suppose that the Glasgow Education Committee made up their minds to design a survey which should demonstrate that occupations of father and mother had small effect on the welfare of their offspring; nor can it be suggested that the Edinburgh Charity Organisation Committee with their trained group of workers and medical adviser Dr Leslie Mackenzie started to show that bad home conditions and alcoholic parents were matters of small moment to the physical and mental condition of the children. Rather in one and all these cases (if the critic does not, as we should, give credit for the existence of a single-minded desire to discover the truth) there would probably be an ingrained philanthropic conception, that the removal of so much misery would lead to most marked improvement in the physique and intelligence of the children, as it would undoubtedly lead to their increased immediate happiness. Nay, there may be some of our readers who know sufficiently intimately the spirit of the Galton Laboratory workers, to give them also credit for having approached this problem of environment with no prejudice in favour of the results

ultimately reached, but rather with a belief that they were about to determine those features of environment, which were the chief sources of physical and mental deficiency in the child.

It may surprise those readers who are not of this class to learn that even after much work had been done in this field, there was still a reasonable anticipation that alcoholism in the parent would be found to have not only, through the direct and cross factors of heredity, a marked influence on the child but toxic and environmental effects of possibly an even graver kind. A strong personal feeling with regard to the slightest alcoholic excess rapidly leads to a bias in favour of attributing to it all the ills of society, and it would have been difficult for us to have claimed entire freedom from this bias when we first approached this subject. Here at least we anticipated that marked environmental effects would be found and quantitatively defined. The result of a first study is embodied in the present paper. What has resulted may be summed up as follows:

(1) There is a higher death rate among the offspring of alcoholic than among the offspring of sober parents. This appears to be more marked in the case of the mother than in the case of the father, and since it is sensibly higher in the case of the mother who has drinking bouts than of the mother who habitually drinks, it would appear to be due very considerably to accidents and gross carelessness and possibly in a minor degree to a toxic effect on the offspring.

Owing to the greater fertility of alcoholic parents, the nett family of the sober is hardly larger than the nett family of the alcoholic.

(2) The mean weight and height of the children of alcoholic parents are slightly greater than those of sober parents, but as the age of the former children is slightly greater, the correlations when corrected for age are slightly positive, i.e. there is slightly greater height and weight in the children of the sober. In the case of the father the correlations are not significant having regard to their probable error; in the case of the mother they may be just significant but they are so slight as to have no importance*.

(3) The wages of the alcoholic as contrasted with those of the sober parent show a slight difference compatible with the employers' dislike for an alcoholic employee, but wholly inconsistent with a marked mental or physical inferiority in the alcoholic parent.

(4) The general health of the children of alcoholic parents appears on the whole slightly better than the health of the children of sober parents. There are fewer delicate children and in a most marked way cases of tuberculosis and epilepsy are less frequent than among the children of sober parents. The source of this relation may be sought in two directions; the physically strongest in the community have probably the greatest capacity and taste for alcohol. Further the higher death rate of the children of alcoholic parents probably leaves the fitter to survive†. Epilepsy and

* These differences even may well be due to a racial differentiation, e.g. to a sprinkling of Irish, or short Celts, among the extreme drinkers.

† Sir Victor Horsley has asserted that the higher death rate,—not a small part of which is also an accident rate—is incompatible with slightly better health in the surviving children. We see no *a priori* basis for such a dogma; it can only be statistically justified.

tuberculosis both depending upon inherited constitutional conditions, they will be more common in the parents of affected offspring, and, probably if combined with alcohol, are incompatible with any length of life or much size of family. If these views be correct, we can only say that parental alcoholism has no marked effect on filial health.

(5) Parental alcoholism is not the source of mental defect in offspring.

(6) The relationship, if any, between parental alcoholism and filial intelligence is so slight, that even its sign cannot be determined from the present material.

(7) The normal visioned and normal refractioned offspring appear to be in rather a preponderance in the families of the drinking parents, the parents who have "bouts" give intermediate results, but there is no substantial relationship between goodness of sight and parental alcoholism. Some explanation was sought on the basis of alcoholic homes driving the children out into the streets. This was found to be markedly the case, the children of alcoholic parents spending much more of their spare time in the street. An examination, however, of the vision and refraction of children with regard to the time they spent in- or out-doors, showed no clear and definite result. The children who spent the whole or most of their spare time in the streets having most myopia and also most normal sight. It was not possible to assert that the outdoor life was better for the sight, or that the better sight of the offspring of alcoholic parentage was due to the greater time spent outdoors.

(8) The frequency of diseases of the eye and eyelids, which might well be attributed to parental neglect, was found to have little, if any, relation to parental alcoholism.

To sum up then, no *marked* relation has been found between the intelligence, physique or disease of the offspring and parental alcoholism in any of the categories investigated. On the whole the balance turns as often in favour of the alcoholic as of the non-alcoholic parentage. It is needless to say that we do not attribute this to the alcohol but to certain physical and possibly mental characters which appear to be associated with the tendency to alcohol. Other categories when investigated may give a different result, but we confess that our experience as to the influence of environment has now been so considerable, that we hardly believe large correlations are likely to occur.

If, as we think, the danger of alcoholic parentage lies chiefly in the direct and cross-hereditary factors of which it is the outward or somatic mark, the problem of those who are fighting alcoholism is one with the fundamental problem of eugenics. We fear it will be long before the temperance reformer takes this to heart. He is fighting a great and in many respects a good fight, and in war all is held fair, even to a show of unjustifiable statistics. Yet the time is approaching when real knowledge must take the place of energetic but untrained philanthropy in dictating the lines of feasible social reform. We can only hope that this intrusion into the field of alcoholic inquiry will be recognised as an earnest attempt to measure the true influences of a grave social evil. Yet we have our fears, for as Plato in the *Euthyphro* reports Socrates to have said: *Ἀθηναίοις γάρ τοι, ὡς ἐμοὶ δοκεῖ, οὐ σφόδρα μέλει, ἄν τινα δεινὸν οἴωνται εἶναι, μὴ μέντοι διδασκαλικὸν τῆς αὑτοῦ σοφίας· ὃν δ' ἂν καὶ ἄλλους οἴωνται ποιεῖν τοιούτους, θυμοῦνται, εἴτ' οὖν φθόνῳ, ὡς σὺ λέγεις, εἴτε δι' ἄλλο τι.*

APPENDIX. TABLES OF DATA.

TABLE I. *Height of Sons when the Father only is Alcoholic (Edinburgh).*

Age of sons

Height of sons in inches	5	6	7	8	9	10	11	12	13	14	Totals
31					1						1
33											
35											
37	1	1									2
39	4	3	1	2							10
41	2	1	7	1	1	1		1			14
43		1	4	3	3	1					12
45		2	9	6	2·5	1·5					21
47			2	5	3	6					16
49				2	5	4	8	1	3		23
51				1	1	7	7	5	2		23
53					1		4	5	1		11
55							1	3	2		6
57								1	1	1	3
59											
61								1			1
Totals	7	8	23	20	17·5	20·5	20	17	9	1	143

TABLE II. *Height of Sons when the Mother only is Alcoholic (Edinburgh).*

Age of sons

Height of sons in inches	5	6	7	8	9	10	11	12	13	14	Totals
31											
33											
35		1									1
37				1							1
39		2									2
41	1		3	1	1						6
43		2	1								3
45	1		1								2
47					2	1					3
49				1	1		1				3
51					1	1	1				3
53						1	1	2	2		6
55						1					1
57									1		1
59											
61											
Totals	2	5	5	3	5	4	3	2	3		32

TABLE III. *Height of Sons when both the Parents are Alcoholic (Edinburgh).*

Age of sons

Height of sons in inches	5	6	7	8	9	10	11	12	13	14	Totals
31											
33											
35	2										2
37	2										2
39	3	2		1							6
41		2	3	2	2			1			10
43	1	4	5	2	2		1				15
45		3	3	9	9	2	1				27
47			1	1	6	5	3	2			18
49			1	1	5	5	6	5	1		24
51					·5	4·5	8	7	3		23
53					1			1	2	1	5
55								2	2	1	5
57								1	2		3
59											
61											
Totals	8	11	13	16	25·5	16·5	19	19	10	2	140

TABLE IV. *Height of Sons when neither Parent is Alcoholic (Edinburgh).*

Age of sons

Height of sons in inches	4	5	6	7	8	9	10	11	12	13	14	Totals
31												
33												
35												
37		3		1		1						5
39	1	4	5	3								13
41		7	16	5	4			1				33
43		3	12	8	11	4	2					40
45		1	6	6	13	11	4	3				44
47			1		10	11	10	3	2			37
49				1	1	6	10	6	4	2		30
51					1	4	5	10	4	6		30
53						2	1	5	8	3		19
55						2		2	3	8		15
57									2	1	1	4
59												
61												
Totals	1	18	40	24	40	41	32	30	23	20	1	270

TABLE V. *Weight of Sons when the Father only is Alcoholic (Edinburgh).*

Weight of sons in lbs.	Age of sons 5	6	7	8	9	10	11	12	13	14	Totals
28		1									1
32	2		2								4
36	3	3	2	2							10
40	2	1	2	3	2	1					11
44		1	7	2	2·5	1·5					14
48		1	8	4	1	2			1		17
52		1	2	2	5	3					13
56				4		3	3	2			12
60				2	3	7	5	2	1		20
64				1	4	3	4	3	1		16
68							6	5	3		14
72							2	1	1		4
76								2			2
80								1	1	1	3
84											
88											
92								1	1		2
Totals	7	8	23	20	17·5	20·5	20	17	9	1	143

TABLE VI. *Weight of Sons when the Mother only is Alcoholic (Edinburgh).*

Weight of sons in lbs.	Age of sons 5	6	7	8	9	10	11	12	13	14	Totals
28		1									1
32	1	1									2
36				1							1
40	1	1	3		1						6
44		2	1	1							4
48			1			1					2
52					1						1
56				1	2		1				4
60											
64					1	1	1		1		4
68						1	1				2
72						1		2	1		4
76											
80											
84											
88									1		1
92											
Totals	2	5	5	3	5	4	3	2	3		32

TABLE VII. *Weight of Sons when both the Parents are Alcoholic (Edinburgh).*

Weight of sons in lbs.	Age of sons 5	6	7	8	9	10	11	12	13	14	Totals
28	1										1
32	4										4
36	2	2	1	1							6
40		2	4	2	3			1			12
44	1	3	4	6	5	1	1				21
48		4	2	5	7	1	2				21
52			1		2	1	1				5
56				2	4·5	6·5	6	2			21
60					2	4	5·	9			20
64			1		2	2	3	3	2		13
68						1	1	2	2		6
72									5	2	7
76								1	1		2
80								1			1
84											
88											
92											
Totals	8	11	13	16	25·5	16·5	19	19	10	2	140

TABLE VIII. *Weight of Sons when neither Parent is Alcoholic (Edinburgh).*

Weight of sons in lbs.	Age of sons 4	5	6	7	8	9	10	11	12	13	14	Totals
28		2										2
32		3	3	3								9
36		6	5	3	1	1						16
40	1	4	12	4	2	2		1				26
44		3	14	10	16	6	1	1				51
48			4	2	6	9	4	1				26
52			2	2	9	6	11		2			32
56					3	8	7	8	1			27
60					3	2	4	7	2	2		20
64						2	3	2	4	4		15
68						4	1	5	5	6		21
72								3	6	4		13
76							1	1	2			4
80								1		1	1	3
84									1	2		3
88						1						1
92										1		1
Totals	1	18	40	24	40	41	32	30	23	20	1	270

TABLE IX. *Height of Daughters when the Father only is Alcoholic (Edinburgh).*

Height of daughters in inches	Age of daughters											
	5	6	7	8	9	10	11	12	13	14	Totals
28											
30	1										1
32											
34	1	1									2
36											
38	4	3									7
40	5	7	1						1		14
42	1	1	4	5	1						12
44		2	4	2	1						9
46		1	1	2	6	3	1				14
48				1	5	4	5				15
50			1		4	2	2	3	1		13
52						1	4	3	2		10
54								1	4		5
56							1		1		2
58									1		1
Totals	12	15	11	10	17	10	13	7	10		105

TABLE X. *Height of Daughters when the Mother only is Alcoholic (Edinburgh).*

Height of daughters in inches	Age of daughters										
	5	6	7	8	9	10	11	12	13	14	Totals
28											
30											
32											
34											
36	1	1									2
38	1	1									2
40	1	1		2							4
42			1	3	1						5
44		1	1		1						3
46			1	2	1	5					9
48							3	1			4
50							3				3
52					1		2	1			4
54							1		1		2
56									1		1
58									2		2
Totals	3	4	3	7	4	5	9	2	4		41

TABLE XI. *Height of Daughters when both the Parents are Alcoholic (Edinburgh).*

Height of daughters in inches	Age of daughters										
	5	6	7	8	9	10	11	12	13	14	Totals
28											
30											
32											
34											
36		2							1		3
38	4	2	3								9
40	2	9	6								17
42	2		8	2	3	1					16
44		2	3	2	4	1					12
46			1	5	8·5	4·5	1		1		21
48				1	3	2	7		1		14
50						5	5	3	5		18
52							2	4	1		7
54								1	2		3
56									1	1	2
58									2		2
60											
62											
Totals	8	15	21	10	18·5	13·5	15	8	14	1	124

TABLE XII. *Height of Daughters when neither Parent is Alcoholic (Edinburgh).*

Height of daughters in inches	Age of daughters										
	5	6	7	8	9	10	11	12	13	14	Totals
28			1	1							2
30					1						1
32											
34	1							1			2
36	3	2						1			6
38	4	4	1								9
40	4	11	5	1							21
42	2	6	13	3	2						26
44		2	5	9	6						22
46		2	3	11	7	2	4	1			30
48				3	8	9	6	2			28
50			1	1	4	5	3	6	1		21
52						5	7	5	1		18
54							3	6	5		14
56						1	1	1	1		4
58									2		2
60											
62									1		1
Totals	14	27	29	29	28	22	24	23	11		207

TABLE XIII. *Weight of Daughters when the Father only is Alcoholic (Edinburgh).*

Weight of daughters in lbs.	Age of daughters 5	6	7	8	9	10	11	12	13	14	Totals
28	2	1									3
32	1	2									3
36	7	5	1								13
40	1	4	3	4	1						13
44	1	1	3	4	1	1	1				12
48		1	2		3	1	1				8
52			1	2	7	2	1				13
56		1	1		2	5	3	1			13
60					2		3	1	1		7
64							2	2	1		5
68					1		1	1	4		7
72									1		1
76							1		1		2
80						1			1		2
84								2	1		3
88											
92											
96											
100											
104											
108											
Totals	12	15	11	10	17	10	13	7	10		105

TABLE XIV. *Weight of Daughters when the Mother only is Alcoholic (Edinburgh).*

Weight of daughters in lbs.	Age of daughters 5	6	7	8	9	10	11	12	13	14	Totals
28	1	1									2
32	1										1
36	1			1	1						3
40		1	2	2							5
44		1		2	1	2					6
48		1	1		1	1					4
52				2		1	1				4
56						1	3	1			5
60							2				2
64											
68					1		2				3
72							1	1	2		4
76											
80											
84											
88									1		1
92											
96											
100											
104											
108									1		1
Totals	3	4	3	7	4	5	9	2	4		41

TABLE XV. *Weight of Daughters when both the Parents are Alcoholic (Edinburgh).*

Weight of daughters in lbs.	Age of daughters 5	6	7	8	9	10	11	12	13	14	Totals
24											
28		2									2
32	3	1	3								7
36	2	8	6		1						17
40	2	3	4	3	6						18
44	1	1	6	1	3	2					14
48			1	5	4·5	2·5	2		1		16
52					3	2	3				8
56			1	1			5	1	3		11
60					1	7	2	3	4		17
64							1	2	1		4
68							1	2			3
72							1				1
76										1	1
80									1		1
84									2		2
88											
92									1		1
96									1		1
Totals	8	15	21	10	18·5	13·5	15	8	14	1	124

TABLE XVI. *Weight of Daughters when neither Parent is Alcoholic (Edinburgh).*

Weight of daughters in lbs.	Age of daughters 5	6	7	8	9	10	11	12	13	14	Totals
24	1										1
28	3	3									6
32	5	3	1								9
36	2	6	6	1							15
40	2	9	11	5	3						30
44		4	6	3	6	1	2				22
48	1	2	4	12	2	2	3				26
52				5	11	4	1	3			24
56			1	2	4	4	4	3			18
60				1	2	6	4	3	2		18
64						1	6	4	1		12
68						2	1	1	3		7
72						1	2	5	2		10
76						1	1	3			5
80								1			1
84											
88											
92									2		2
96											
116									1		1
Totals	14	27	29	29	28	22	24	23	11		207

TABLE XVII. *Paternal Alcoholism & Health of Son (Manchester).*

Health of son	Father: Temperate	Father: Intemperate	Totals
Healthy	346·5	126·5	473
Delicate	89·5	28·5	118
Phthisis	7	3	10
Epileptic.....	30	5	35
Died young...	133	42	175
Totals	606	205	811

TABLE XVIII. *Paternal Alcoholism & Health of Daughter (Manchester).*

Health of daughter	Father: Temperate	Father: Intemperate	Totals
Healthy	262	109	371
Delicate	67	29	96
Phthisis	4	3	7
Epileptic.....	37	5	42
Died young...	83	38	121
Totals	453	184	637

TABLE XIX. *Maternal Alcoholism & Health of Son (Manchester).*

Health of son	Mother: Temperate	Mother: Intemperate	Totals
Healthy	306	55·5	361·5
Delicate	80	17·5	97·5
Phthisis	5	1	6
Epileptic.....	23	1	24
Died young...	118	15	133
Totals	532	90	622

TABLE XX. *Maternal Alcoholism & Health of Daughter (Manchester).*

Health of daughter	Mother: Temperate	Mother: Intemperate	Totals
Healthy	239·5	38	277·5
Delicate	59·5	12	71·5
Phthisis	3	1	4
Epileptic.....	31	1	32
Died young...	73	14	87
Totals	406	66	472

TABLE XXI. *Paternal Alcoholism & Health of Son (Edinburgh).*

Health of son	Father: Teeto-taller	Sober	Drink suspected	Drinks	Bouts	Totals
Healthy...	4	51	4	50	24	133
Glands ...	2	68	1	64	44	179
Chest.....		10		17	8	35
Heart.....	3	7	1	12	6	29
Other diseases		29		15	6	50
Totals ...	9	165	6	158	88	426

TABLE XXII. *Paternal Alcoholism & Health of Daughter (Edinburgh).*

Health of daughter	Father: Teeto-taller	Sober	Drink suspected	Drinks	Bouts	Totals
Healthy...	2	52	6	46	21	127
Glands ...	8	65	10	64	36	183
Chest.....	2	13	3	14	8	40
Heart.....		9		10	2	21
Other diseases		17		10	5	32
Totals ...	12	156	19	144	72	403

TABLE XXIII. *Maternal Alcoholism & Health of Son (Edinburgh).*

Health of son	Mother: Teeto-taller	Sober	Drink suspected	Drinks	Bouts	Totals
Healthy...	4	82	4	35	12	137
Glands ...	2	103	6	55	26	192
Chest		23		11	4	38
Heart.....	1	15	1	8	1	26
Other diseases	1	37	1	8	4	51
Totals ...	8	260	12	117	47	444

TABLE XXIV. *Maternal Alcoholism & Health of Daughter (Edinburgh).*

Health of daughter	Mother: Teeto-taller	Sober	Drink suspected	Drinks	Bouts	Totals
Healthy...	1	73	7	48	7	136
Glands ...	8	103	7	64	18	200
Chest.....	2	33	1	11	4	51
Heart.....		16	1	6	3	26
Other diseases	1	24		8	4	37
Totals ...	12	249	16	137	36	450

TABLE XXV. *Paternal Alcoholism & Intelligence of Son (Manchester).*

Father

Intelligence of son	Temperate	Intemperate	Totals
Normal	455	183	638
Mentally defective	319	95	414
Totals	774	278	1052

TABLE XXVI. *Paternal Alcoholism & Intelligence of Daughter (Manchester).*

Father

Intelligence of daughter	Temperate	Intemperate	Totals
Normal	472	191	663
Mentally defective	210	80	290
Totals	682	271	953

TABLE XXVII. *Maternal Alcoholism & Intelligence of Son (Manchester).*

Mother

Intelligence of son	Temperate	Intemperate	Totals
Normal	404	72	476
Mentally defective	260	48	308
Totals	664	120	784

TABLE XXVIII. *Maternal Alcoholism & Intelligence of Daughter (Manchester).*

Mother

Intelligence of daughter	Temperate	Intemperate	Totals
Normal	393	75	468
Mentally defective	169	24	193
Totals	562	99	661

TABLE XXIX. *Paternal Alcoholism & Intelligence of Son (Edinburgh).*

Father

Intelligence of son	Teetotaller	Sober	Drink suspected	Drinks	Bouts	Totals
Excellent	2	19	3	9	11	44
Good	6	94	3	84	27	214
Medium	5	88	4	81	37	215
Dull	2	44	1	31	12	90
Defective		8		7	1	16
Totals	15	253	11	212	88	579

TABLE XXX. *Paternal Alcoholism & Intelligence of Daughter (Edinburgh).*

Father

Intelligence of daughter	Teetotaller	Sober	Drink suspected	Drinks	Bouts	Totals
Excellent		13		13	3	29
Good	6	69	9	62	38	184
Medium	8	82	4	75	35	204
Dull	3	31	6	31	12	83
Defective		4	1	4	4	13
Totals	17	199	20	185	92	513

TABLE XXXI. *Maternal Alcoholism & Intelligence of Son (Edinburgh).*

Mother

Intelligence of son	Teetotaller	Sober	Drink suspected	Drinks	Bouts	Totals
Excellent	1	27	1	11	3	43
Good	5	150	5	60	25	245
Medium	4	148	4	51	19	226
Dull	3	63	2	23	11	102
Defective	1	7	1	4		13
Totals	14	395	13	149	58	629

TABLE XXXII. *Maternal Alcoholism & Intelligence of Daughter (Edinburgh).*

Mother

Intelligence of daughter	Teetotaller	Sober	Drink suspected	Drinks	Bouts	Totals
Excellent	1	16		10	3	30
Good	4	130	7	51	13	205
Medium	6	124	7	64	13	214
Dull	3	47	4	29	7	90
Defective		9		4	3	16
Totals	14	326	18	158	39	555

TABLE XXXIII. *Paternal Alcoholism & Refraction of Son (Edinburgh).*

Son's eyesight (Refraction) / Father	Teeto-taller	Sober	Drink sus-pected	Drinks	Bouts	Totals
Normal	12	291	20	296	138	757
Hypermetropia	4	101	2	51	39	197
Hypermetropic astigmatism	5	58		31	23	117
Mixed astig-matism	3	19		16	7	45
Myopia		9		5	5	19
Myopic astig-matism	2	4		5	6	17
Totals	26	482	22	404	218	1152

TABLE XXXIV. *Paternal Alcoholism & Refraction of Daughter (Edinburgh).*

Daughter's eyesight (Refraction) / Father	Teeto-taller	Sober	Drink sus-pected	Drinks	Bouts	Totals
Normal	8	226	22	209	105	570
Hypermetropia	10	62	8	54	29	163
Hypermetropic astigmatism	4	53	6	56	29	148
Mixed astig-matism	8	18	2	8	10	46
Myopia	3	9		3	4	19
Myopic astig-matism	1	8		6	5	20
Totals	34	376	38	336	182	966

TABLE XXXV. *Maternal Alcoholism & Refraction of Son (Edinburgh).*

Son's eyesight (Refraction) / Mother	Teeto-taller	Sober	Drink sus-pected	Drinks	Bouts	Totals
Normal	12	494	22	210	68	806
Hypermetropia	2	121		42	27	192
Hypermetropic astigmatism	8	81	6	34	11	140
Mixed astig-matism	2	31		4	5	42
Myopia		16		4	1	21
Myopic astig-matism	2	15			2	19
Totals	26	758	28	294	114	1220

TABLE XXXVI. *Maternal Alcoholism & Refraction of Daughter (Edinburgh).*

Daughter's eyesight (Refraction) / Mother	Teeto-taller	Sober	Drink sus-pected	Drinks	Bouts	Totals
Normal	8	371	22	194	47	642
Hypermetropia	6	103		46	5	160
Hypermetropic astigmatism	2	97	4	39	12	154
Mixed astig-matism	9	34	5	10	7	65
Myopia	2	10	1	1	4	18
Myopic astig-matism	1	9	2	6	1	19
Totals	28	624	34	296	76	1058

TABLE XXXVII. *Paternal Alcoholism & Acuity of Vision of Son (Edinburgh).*

Acuity of vision of son / Father	Teeto-taller	Sober	Drink sus-pected	Drinks	Bouts	Totals
Normal...	6	162	10	155	74	407
6/9.....	3	38		17	11	69
6/12	1	10		8	5	24
6/18	3	23		14	13	53
6/24		1		5	2	8
Rest	1	6		5	4	16
Totals ...	14	240	10	204	109	577

TABLE XXXVIII. *Paternal Alcoholism & Acuity of Vision of Daughter (Edinburgh).*

Acuity of vision of daughter / Father	Teeto-taller	Sober	Drink sus-pected	Drinks	Bouts	Totals
Normal...	7	125	11	111	60	314
6/9.....	5	26	1	21	9	62
6/12	2	11	3	15	6	37
6/18	2	18	4	15	8	47
6/24		4		5	3	12
Rest	1	6		3	3	13
Totals...	17	190	19	170	89	485

TABLE XXXIX. *Maternal Alcoholism & Acuity of Vision of Son (Edinburgh).*

Acuity of vision of son \ Mother	Teeto-taller	Sober	Drink sus-pected	Drinks	Bouts	Totals
Normal...	5	262	11	109	36	423
6/9.....	3	42	1	14	7	67
6/12		19	1	6	1	27
6/18	3	36	1	10	8	58
6/24	1	6		1	2	10
Rest	1	11		7	1	20
Totals...	13	376	14	147	55	605

TABLE XL. *Maternal Alcoholism & Acuity of Vision of Daughter (Edinburgh).*

Acuity of vision of daughter \ Mother	Teeto-taller	Sober	Drink sus-pected	Drinks	Bouts	Totals
Normal...	7	204	12	100	24	347
6/9.....	5	44		18	3	70
6/12		19	2	13	4	38
6/18	1	34	1	12	3	51
6/24		3	1	5	2	11
Rest	1	7		3	3	14
Totals...	14	311	16	151	39	531

TABLE XLI. *Paternal Alcoholism & Son's Eye Disease (Edinburgh).*

Eye disease of son \ Father	Teeto-taller	Sober	Drink sus-pected	Drinks	Bouts	Totals
Normal.....	12	220	11	190	103	536
Conjunctivitis		5		2	3	10
Corneal nebulae	1	7		5	1	14
Blepharitis ...		4		4	2	10
Others		1		2		3
Squint	1	9		7	2	19
Totals	14	246	11	210	111	592

TABLE XLII. *Paternal Alcoholism & Daughter's Eye Disease (Edinburgh).*

Eye disease of daughter \ Father	Teeto-taller	Sober	Drink sus-pected	Drinks	Bouts	Totals
Normal.....	14	167	17	152	79	429
Conjunctivitis		3	1	5	3	12
Corneal nebulae	2	5		6	3	16
Blepharitis		9		3	2	14
Others		4			1	5
Squint	1	5	1	7	3	17
Totals	17	193	19	173	91	493

TABLE XLIII. *Maternal Alcoholism & Son's Eye Disease (Edinburgh).*

Eye disease of son \ Mother	Teeto-taller	Sober	Drink sus-pected	Drinks	Bouts	Totals
Normal.....	12	348	12	136	51	559
Conjunctivitis		2	1	3	2	8
Corneal nebulae		12		4	1	17
Blepharitis ...		5	1	2	1	9
Others		4				4
Squint	1	13		6	2	22
Totals	13	384	14	151	57	619

TABLE XLIV. *Maternal Alcoholism & Daughter's Eye Disease (Edinburgh).*

Eye disease of daughter \ Mother	Teeto-taller	Sober	Drink sus-pected	Drinks	Bouts	Totals
Normal.....	11	268	15	132	36	462
Conjunctivitis		6	2	4		12
Corneal nebulae	2	9		4	1	16
Blepharitis ...		12		5		17
Others		2	1	1	1	5
Squint	1	8		7		16
Totals	14	305	18	153	38	528

TABLE XLV. *Paternal Alcoholism & where the Son spends his Spare Time (Edinburgh).*

Father

Where son spends his time	Teeto-taller	Sober	Drink sus-pected	Drinks	Bouts	Totals
House	10	119	9	67	35	240
Part house		40	1	17	10	68
House and out-door occupation		35		18	15	68
Part streets	3	29	2	26	14	74
Streets	2	41	3	79	43	168
Totals	15	264	15	207	117	618

TABLE XLVI. *Paternal Alcoholism & where the Daughter spends her Spare Time (Edinburgh).*

Father

Where daughter spends her time	Teeto-taller	Sober	Drink sus-pected	Drinks	Bouts	Totals
House	11	122	17	80	40	270
Part house...		36	1	18	15	70
Part streets	6	20	3	34	15	78
Streets		40	1	49	21	111
Totals ...	17	218	22	181	91	529

TABLE XLVII. *Maternal Alcoholism & where the Son spends his Spare Time (Edinburgh).*

Mother

Where son spends his time	Teeto-taller	Sober	Drink sus-pected	Drinks	Bouts	Totals
House	8	171	9	39	18	245
Part house	1	51	4	12	6	74
House and out-door occupation		54		11	5	70
Part streets	3	42	1	19	11	76
Streets	3	70	3	68	26	170
Totals	15	388	17	149	66	635

TABLE XLVIII. *Maternal Alcoholism & where the Daughter spends her Spare Time (Edinburgh).*

Mother

Where daughter spends her time	Teeto-taller	Sober	Drink sus-pected	Drinks	Bouts	Totals
House	7	189	9	70	18	293
Part house...		48	3	20	7	78
Part streets	6	47	3	21	7	84
Streets	1	44	3	51	11	110
Totals ...	14	328	18	162	43	565

TABLE XLIX. *Where the Son spends his Spare Time & his Acuity of Vision (Edinburgh).*

Son

Acuity of vision of son	House	Part house	House and outdoor occupation	Part streets	Streets	Totals
Normal	187	38	51	58	129	463
6/9	29	12	5	11	11	68
6/12 ...	9	6	2	5	5	27
6/18 ...	23	6	7	10	19	65
6/24 ...	5	1	1		3	10
Rest ...	6	1	1	3	2	13
Totals...	259	64	67	87	169	646

TABLE L. *Where the Daughter spends her Spare Time & her Acuity of Vision (Edinburgh).*

Daughter

Acuity of vision of daughter	House	Part house	Part streets	Streets	Totals
Normal	192	45	55	55	347
6/9	37	16	17	5	75
6/12 ...	15	8	11	2	36
6/18 ...	34	5	13	4	56
6/24 ...	7	1	1	4	13
Rest ...	1	1		5	7
Totals...	286	76	97	75	534

TABLE LI. *Where the Son spends his Spare Time & his Refraction (Edinburgh).*

Refraction of son	House	Part house	House and outdoor occupation	Part streets	Streets	Totals
Normal	340	59	101	98	252	850
Hypermetropia	85	35	14	33	42	209
Hypermetropic astigmatism	60	26	11	29	19	145
Mixed astig.	20	6	5	6	8	45
Myopia and myopic astig.	13	2	3	8	17	43
Totals	518	128	134	174	338	1292

TABLE LII. *Where the Daughter spends her Spare Time & her Refraction (Edinburgh).*

Refraction of daughter	House	Part house	Part streets	Streets	Totals
Normal	361	66	98	110	635
Hypermetropia	76	42	36	16	170
Hypermetropic astigmatism	88	28	28	14	158
Mixed astig.	30	5	16	5	56
Myopia and myopic astig.	17	11	16	5	49
Totals	572	152	194	150	1068

TABLE LIII. *Paternal Alcoholism & Number of Dead Children (Edinburgh).*

Number of dead children	Teetotaller	Sober	Drink suspected	Drinks	Bouts	Totals
0	4	92	4	57	28	185
1		54	6	59	22	141
2	3	46	6	37	30	122
3	2	31		27	18	78
4	2	18		22	7	49
5		9	1	10	7	27
6		5		3	2	10
7	1	4	1	5		11
8	2		1	3	1	7
9		1		2	1	4
10						
11		1				1
Totals ...	14	261	19	225	116	635

TABLE LIV. *Paternal Alcoholism & total Number of Children (Edinburgh).*

Total number of children	Teetotaller	Sober	Drink suspected	Drinks	Bouts	Totals
1		9	1	3	5	18
2		21	2	8	6	37
3	2	24	1	23	11	61
4	1	31		24	14	70
5	1	32	4	31	18	86
6	3	37		38	13	91
7		35	4	38	16	93
8	1	35	4	17	12	69
9	1	13	1	21	6	42
10	2	5		11	6	24
11	2	11	1	7	6	27
12		7		4	2	13
13			1		1	2
14	1					1
15		1				1
Totals ...	14	261	19	225	116	635

TABLE LV. *Maternal Alcoholism & Number of Dead Children (Edinburgh).*

Number of dead children	Teetotaller	Sober	Drink suspected	Drinks	Bouts	Totals
0	4	133	7	45	14	203
1	1	93	3	46	11	154
2	3	80	3	28	14	128
3	1	46	3	24	10	84
4	2	27	1	16	3	49
5		17	1	9	4	31
6		8		2	3	13
7	1	2	1	6	1	11
8	1	1		4	2	8
9		1		2		3
10						
11		1				1
Totals ...	13	409	19	182	62	685

TABLE LVI. *Maternal Alcoholism & total Number of Children (Edinburgh).*

Total number of children	Teetotaller	Sober	Drink suspected	Drinks	Bouts	Totals
1		14	1	4	3	22
2		28	2	9	3	42
3	2	37	1	17	5	62
4	2	46	3	20	3	74
5		70	2	16	10	98
6	2	61	2	29	6	100
7		46	2	37	11	96
8	2	47	3	16	8	76
9	1	24	1	11	6	43
10	1	9	2	8	4	24
11	2	17		8	1	28
12	1	7		5	2	15
13		1		1		2
14				1		1
15		2				2
Totals ...	13	409	19	182	62	685

TABLE LVII. *Paternal Alcoholism & Number of Dead Children (Manchester).*

Father

Number of dead children	Temperate	Intemperate	Totals
0	174	39	213
1	113	31	144
2	72	22	94
3	41	20	61
4	23	15	38
5	13	6	19
6	5	2	7
7	7	3	10
8	6	5	11
9		1	1
10			
11	1	2	3
Totals	455	146	601

TABLE LVIII. *Maternal Alcoholism & Number of Dead Children (Manchester).*

Mother

Number of dead children	Temperate	Intemperate	Totals
0	135	21	156
1	106	9	115
2	65	10	75
3	33	9	42
4	19	7	26
5	13	4	17
6	5		5
7	7	2	9
8	6	1	7
9			
10			
11		1	1
Totals	389	64	453

TABLE LIX. *Paternal Alcoholism & total Number of Children (Manchester).*

Father

Total number of children	Temperate	Intemperate	Totals
1	13	3	16
2	51	10	61
3	53	11	64
4	60	17	77
5	66	17	83
6	59	23	82
7	41	18	59
8	27	9	36
9	28	9	37
10	23	9	32
11	11	5	16
12	15	4	19
13	4	4	8
14	2	1	3
15	1	3	4
16	1	1	2
17		2	2
Totals	455	146	601

TABLE LX. *Maternal Alcoholism & total Number of Children (Manchester).*

Mother

Total number of children	Temperate	Intemperate	Totals
1	12	2	14
2	26	5	31
3	54	5	59
4	52	8	60
5	58	9	67
6	53	11	64
7	35	3	38
8	23	5	28
9	24	4	28
10	22	5	27
11	9	2	11
12	15	2	17
13	2	2	4
14	1		1
15	1		1
16	2		2
17		1	1
Totals	389	64	453

TABLE LXI. *Number of Dead Children & total Number of Children (Manchester).*

Total number of children	Number of dead children												
	0	1	2	3	4	5	6	7	8	9	10	11	Totals
1	16												16
2	51	10											61
3	40	20	4										64
4	32	34	7	4									77
5	32	29	16	4	2								83
6	22	24	17	14	4	1							82
7	10	10	18	11	7	2	1						59
8	6	7	11	8	2	2							36
9	2	8	9	10	5		1	1	1				37
10	1	1	7	6	9	5	1	2					32
11		1	1	3	5	2		2	2				16
12	1		1	1	3	4	2	2	5				19
13			2		1	1	1	2	1				8
14						1		1		1			3
15			1			1	1					1	4
16									2				2
17												2	2
Totals...	213	144	94	61	38	19	7	10	11	1		3	601

TABLE LXII. *Number of Dead Children & total Number of Children (Edinburgh).*

Total number of children	Number of dead children												
	0	1	2	3	4	5	6	7	8	9	10	11	Totals
1	22												22
2	33	9											42
3	43	14	5										62
4	35	23	14	2									74
5	27	34	27	9	1								98
6	21	30	22	18	7	2							100
7	14	22	24	26	7	3							96
8	7	12	20	13	9	11	2	2					76
9	1	10	9	7	10	2	3	1					43
10			2	4	2	7	2	3	3	1			24
11			2	5	11	2	4	2	1	1			28
12			2		2	3	2	3	2	1			15
13			1			1							2
14									1				1
15									1			1	2
Totals...	203	154	128	84	49	31	13	11	8	3		1	685

LXIII. DEVIATIONS FROM THE SCALE LINE BETWEEN ALCOHOLIC AND NON-ALCOHOLIC PARENTS MEASURED IN TERMS OF THE STANDARD DEVIATION.

(i) *Paternal Alcoholism (Manchester).*

Health of child	Grade of Alcoholism: Son	Daughter
Healthy	−·62	−·54
Delicate	−·70	−·52
Phthisis and epilepsy	−·92	−·98
Died young	−·71	−·48
Mean Alcoholism	−·67	−·56

(ii) *Maternal Alcoholism (Manchester).*

Grade of Alcoholism: Son	Daughter
−1·02	−1·08
− ·93	− ·95
−1·50	−1·58
−1·21	− ·98
−1·06	−1·08

(iii) *Paternal Alcoholism (Edinburgh).*

Health of child	Grade of Alcoholism
Healthy	·20
Glands	·26
Heart	·30
Chest	·43
Other diseases	−·15
Mean Alcoholism	·22

(iv) *Maternal Alcoholism (Edinburgh).*

Grade of Alcoholism
−·21
−·13
−·29
−·39
−·57
−·23

(v) *Paternal Alcoholism (Edinburgh).*

Intelligence	Grade of Alcoholism: Son	Daughter
Excellent	·06	·13
Good	·08	·23
Medium	·17	·15
Dull	−·02	·26
Mean Alcoholism	·09	·20

(vi) *Maternal Alcoholism (Edinburgh).*

Grade of Alcoholism: Son	Daughter
−·39	−·17
−·34	−·39
−·45	−·27
−·37	−·14
−·39	−·29

(vii) *Paternal Alcoholism (Edinburgh).*

Refraction	Grade of Alcoholism: Son	Daughter
Normal	·25	·22
Hypermetropia	−·08	·15
Hypermetropic astigmatism	−·10	·29
Mixed astigmatism	·28	−·16
Myopic astigmatism	·21	−·10
Mean Alcoholism	·15	·19

(viii) *Maternal Alcoholism (Edinburgh).*

Grade of Alcoholism: Son	Daughter
−·32	−·23
−·36	−·47
−·34	−·36
−·78	−·41
−·93	−·24
−·36	−·29

(ix) *Paternal Alcoholism (Edinburgh).*

Acuity of Vision	Grade of Alcoholism: Son	Daughter
Normal	·22	·20
6/9	−·24	·00
6/12	·10	·38
6/18	·02	·19
Rest	·43	·15
Mean Alcoholism	·15	·18

(x) *Maternal Alcoholism (Edinburgh).*

Grade of Alcoholism: Son	Daughter
−·33	−·27
−·46	−·53
−·50	·00
−·45	−·48
−·34	·15
−·37	−·28

The meaning of these tables is as follows: The standard deviation, on the basis of a normal distribution of the alcoholic taste, is taken as our arbitrary scale unit. The zero of the scale is the line between sober and alcoholic in the estimation of the observer. Thus in (i) we have on this scale the average

amounts of alcoholism of fathers of sons of different health categories. The mean parent possesses the grade $-\cdot67$ of alcoholism, *i.e.* is "negatively alcoholic" or sober. The parent of healthy children is less sober ($-\cdot62$) than the mean, and the parent of phthisical and epileptic children has a considerably greater degree of average sobriety than the mean parent.

LXIV. DEVIATIONS FROM THE SCALE LINE BETWEEN SPENDING THE TIME IN THE HOUSE AND SPENDING THE TIME IN THE STREETS MEASURED IN TERMS OF THE STANDARD DEVIATION.

(i) *Where the Child spends its Time* (*Edinburgh*).

Refraction	Grade of Time in Streets: Son	Daughter
Normal	$-\cdot52$	$-\cdot92$
Hypermetropia	$-\cdot82$	$-1\cdot29$
Hypermetropic Astigmatism	$-1\cdot10$	$-1\cdot32$
Mixed Astigmatism	$-\cdot90$	$-1\cdot32$
Myopic Astigmatism	$-\cdot26$	$-1\cdot24$
Mean Place where Child spends Time ...	$-\cdot62$	$-1\cdot06$

(ii) *Where the Child spends its Time* (*Edinburgh*).

Acuity of Vision	Grade of Time in Streets: Son	Daughter
Normal	$-\cdot59$	$-1\cdot00$
6/9	$-\cdot99$	$-1\cdot50$
6/12	$-\cdot90$	$-1\cdot59$
6/18	$-\cdot55$	$-1\cdot46$
Rest	$-\cdot78$	$-\cdot14$
Mean Place where Child spends Time ...	$-\cdot64$	$-1\cdot08$

Table LXIV is constructed on the same principle. The amount of time spent in the streets by the child takes the place of the parent's alcoholic tendency, and its standard deviation is the arbitrary scale unit. The zero of the scale is all spare time in the streets. The mean boy in (i) spends a negative amount of time in the streets, *i.e.* he stands at $-\cdot62$ on this scale. The mean girl at $-1\cdot06$, or she is still longer indoors. An emetropic boy is more ($-\cdot52$) in the streets than the mean boy, and a myopic boy ($-\cdot26$) more in the streets than the emetropic boy. The emetropic girl is more ($-\cdot92$) in the streets than the mean girl ($-1\cdot06$), but the myopic girl is more ($-1\cdot24$) in the house than the emetropic girl, but less in the house than the astigmatic and hypermetropic girls.

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